



OS-20 One Step Mailer

Operator & Service Manual

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Prepared by:

GBR Systems Corporation

Technical Publications

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INTRODUCTION

This is the OS-8 & OS-20 One Step Mailer Service Manual. It is a work in progress, which will be updated to include refinements to the product. This manual contains Operating Procedures, Service Call Procedures, Diagnostic Procedures, General information, Repair Analysis Procedures, Copy Quality Analysis Procedures, Wiring Data, and Parts Lists that will enable the Service Representative to repair OS-8 & OS-20 One Step Mailer failures.

USING THE MANUAL

1. TABLE OF CONTENTS

Each capitalized alphabetic character represents a major division within the manual (Section A).

Under each major division, a number follows the capital letter. This represents a subdivision of the major section (Section A1. is a subdivision of A.).

Under each subdivision, an alpha-numeric combination is followed by a decimal and a lower case letter. This represents a smaller division under a subdivision (Section A1.a. is a subdivision of A1., Section A1.a1. is a subsection of A1.a.).

Each major section of the manual begins with page 1 and is numbered in sequence through that section only. Section A begins with page 1, section B begins with page 1, etc. There are not necessarily any subdivisions beyond level 1 in a Parts Catalog.

This manual is divided into Section A through I. A detailed table of contents is located on the first page of each section.

[SECTION A INTRODUCTION](#)

[SECTION B OPERATION](#)

[SECTION C MAINTENANCE](#)

[SECTION D ADJUSTMENTS](#)

[SECTION E ALARM MESSAGES](#)

[SECTION F REPAIR AND REPLACEMENT](#)

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[SECTION H SCHEMATICS](#)

[SECTION I PAPER SELECTION](#)

2. HEADERS / FOOTERS

The information listed along the left edge refers to the machine, the manual type, and the part number and revision level for that manual

The particular issue listed in the center is an internal tracking device.

The top line of information along the right side states the title of the particular section. The bottom line lists the section and the page number within that section.

3. LIST OF CHANGES IN THIS REVISION

ECN:

Date: 09/04

Previous release:

Changes incorporated in this manual: OS-8 & OS-20 Service Manual Issue 09/04 <Rev. ->

| <u>Section</u> | <u>Change</u> |
|----------------|---------------|
|----------------|---------------|

4. SECTION ISSUE DATES

Sect A

Sect B

Sect C

Sect D

Sect E

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Sect G

Sect H

Sect I

ORGANIZATION

This manual is divided into nine sections. The title and description of each section of the manual is as follows:

Section A- Introduction

This section is used to describe the components of the systems, how they interrelate and perform their functions.

Section B – Operation

This section contains the procedures necessary to set up a job and a complete description of the glue system, including glue system maintenance.

Section C - Maintenance

This section describes day to day maintenance that will assure maximum up time for the machine.

Section D - Adjustments

This section contains the instructions for adjustment of the moving parts.

Section E – Alarm Messages

This section contains messages that occur when a problem arises with operation. A brief description of the problem indicates the likely cause and solution.

Section F – Repair and Replacement

This section contains the diagnostics available to troubleshoot problems. There is also brief repair analysis description.

Section G – Parts

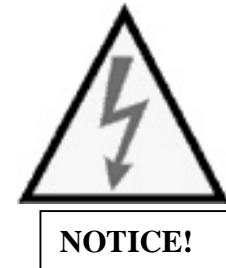
This section includes assembly drawings with the list of parts.

Section H – Schematics

Section I – Paper Selection

LABELS

ELECTROSTATIC CHARGE- This caution indicates that there are components that are sensitive to damage caused by electrostatic discharge.



The labels shown may be affixed to the OS-8 & OS-20 at appropriate locations. Observe safety precautions as indicated



by these.

SECTION A - INTRODUCTION

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A.1 DESCRIPTION OF OPERATION

The GBR Systems Corp. OS-20 can feed, fold, glue and perforate a preprinted sheet of paper, turning it into a ready-to-mail package.

The bottom sheet is fed from the stack and verified to be a single sheet. The sheet is then fed into the folder where glue is applied to the sides and to the open end of the “C” folded sheet. As the sheet exits the folder, perforations are put into the sides. The finished mailer is then shingle stacked on a take-away conveyor.

In the folder there are four buckle plates. Buckle plates number one and three are located on the topside of the folder, numbers two and four are located on the bottom side of the folder. They are called buckle plates because they cause the paper to buckle in the folder rollers. When the sheet reaches the buckle stop in the buckle plate, it is still being driven by the previous set of folder rollers. Unable to continue traveling in the buckle plate, the sheet bends, or buckles, inside of the folder rollers and is pinched by the next set of rollers, making the fold in the sheet.

The folder rollers are located in the folder at the end of the transfer conveyor. The paper travels down the transfer conveyor and enters the folder in between the top two folder rollers. Before the sheet passes through these rollers, glue is applied to the sides of the sheet. When the sheet reaches the end of the first buckle plate, it is pinched between rollers #2 and #3 and driven into buckle plate #2. When the sheet reaches the end of buckle plate #2 it is pinched between rollers #3 and #4 and driven out to the discharge rollers. As it passes between the discharge rollers, rotary-perforating knives put the perforations into the sides of the sheet. The sheet is discharged onto the Exit Conveyor where it is shingle stacked. The folder rollers have two functions:

- They drive the paper through the rollers
- They crease the paper where it is buckled

Secondary documents are fed from two feeders located on top of the Folder. Secondary documents are pre-staged in preparation for insertion just above the folder section at a staging gate. When the Insert Feeder software detects a primary document at the Prefeed Sensor input, the staging gate is opened and the secondary documents are inserted. The next set of secondary documents are fed through to the staging gate in preparation for the primary document. Each primary document processed increments a count displayed on the Operator Station display. The Insert Feeder software controls and monitors the insertion of the secondary documents into the primary document. In the event of a misfeed or other error the software stops the Insertion Feeder and provides messages to pinpoint the source of the error. Setup options are provided to configure the number and source of secondary documents to be inserted as well as perform maintenance, configuration, and diagnostics. Setup options are retained in battery-backed RAM.

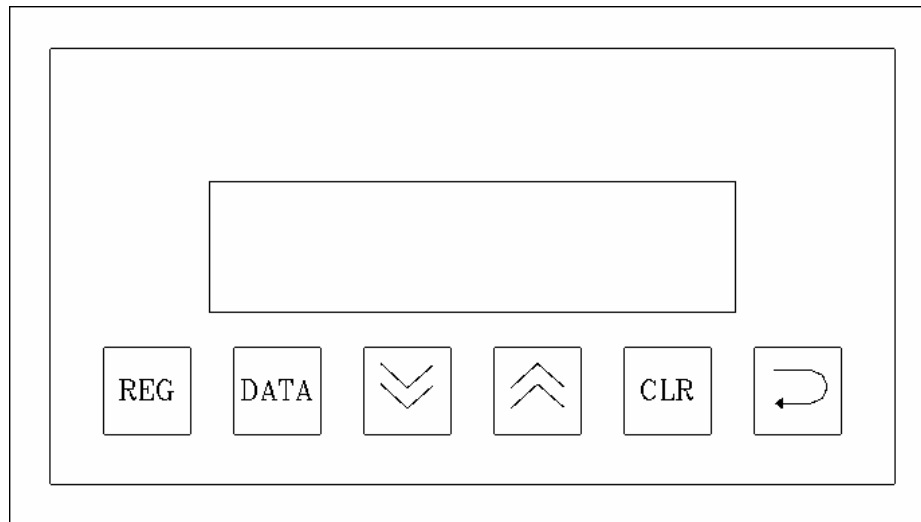
OS-20 Machine



The glue system consists of a pressurized, closed-loop glue delivery system. Computer-controlled distribution deposits a shaped bead of glue onto the sheet of paper. The glue guns apply adhesive when a sensor has detected the paper edge. To assure that the adhesive does not come in contact with the folder rollers, the rollers have been grooved in appropriate places. These grooves are covered with nonstick material to facilitate cleanup.

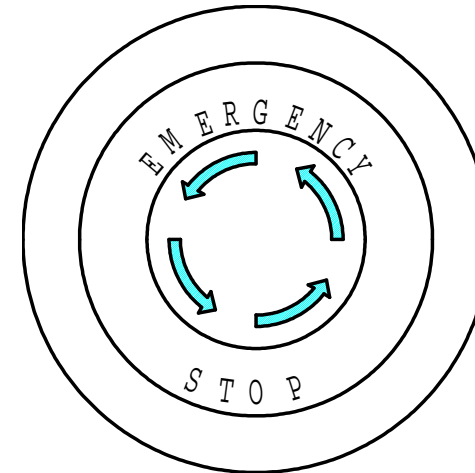
A.2 SETUP

Operator Program Panel



A.3 EMERGENCY STOP

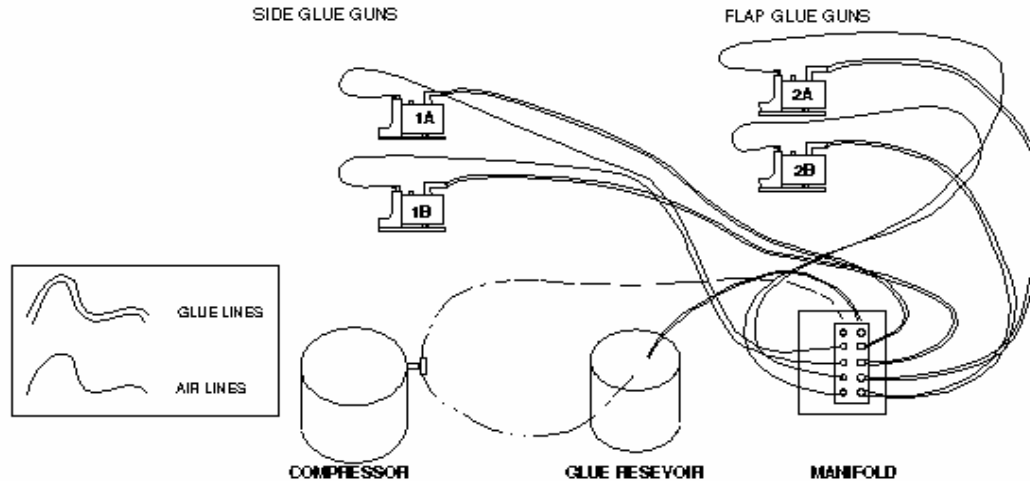
The EMERGENCY STOP is located near the folder. It is red in color and is a “latching” switch. This means that once it is pressed, it remains off until reset. When the EMERGENCY STOP is pressed, the 24-volt DC supplied to the machine is removed. This causes all of the peripheral devices connected to the PLC to turn off. Once the EMERGENCY STOP is depressed, the OS-20 stops processing paper immediately. To start the machine processing paper again, the operator must reset the EMERGENCY STOP by rotating the stop button in the direction of the arrows. Lifting either of the interlocked covers will also stop the machine. To restart after a cover has been lifted, the cover must be put back down.



Emergency Stop Button

A.4 GLUE SYSTEM DESCRIPTION

Document sealing consists of a closed loop, pressurized glue delivery system. A compressor provides the air pressure which forces the glue through the system and out of the glue guns. The glue is stored in a sealed, pressurized container, with air inlet and glue outlet tubes. Glue and air are distributed to the glue guns through a manifold.



When not in use, the glue guns have a tip sealer that keeps the glue from coagulating in the nozzle. This feature allows the system to sit idle for up to two days without the need for purging. After any short period of idleness the glue guns can be easily purged to assure a smooth flow of glue when operation begins. When an extended period of inactivity is to occur, the glue system should be flushed thoroughly with warm water.

NOTE: Whenever glue system is left idle, either filled with glue or warm water, it should be left in a pressurized state.

It is recommended that, before starting a new production run or resuming the run after lunch, a little glue should be purged from each glue gun. This ensures that the first sheet fed through the OS-20 has the correct amount of glue dispensed.

Periodically check buckle plates and folding rollers for glue buildup on paper path surfaces. Such buildup will eventually affect throughput and folding quality. Crooked folds are the first indication that cleaning is required. When cleaning, always use warm water and the spudger.

Spudger PN 077-SH80



A dedicated computer controls the action of the glue guns by electronically pulsing the glue guns according to operator-set parameters. Specific glue placement parameters are coordinated with timing information that the operator sets through the touch screen. An encoder provides the glue system with paper speed information to aid with timing the glue operation. As paper travels past the singulator and through the alignment portion of the OS-20 sensors monitor its path. When the glue sensors detect the trailing edge of a sheet of paper they signal for the glue guns to fire. The operator can specify a very precise glue pattern for the sides and the flap of the document.

The OS-20 is configured with four glue guns: two side glue guns and two flap glue guns. The glue gun controller individually controls each gun. The glue gun controller can control up to 16 glue guns. An optional Business Reply Envelope (B.R.E.) feature is available.

A.5 THEORY OF OPERATION

A.5a Programmable Logic Controller (PLC)

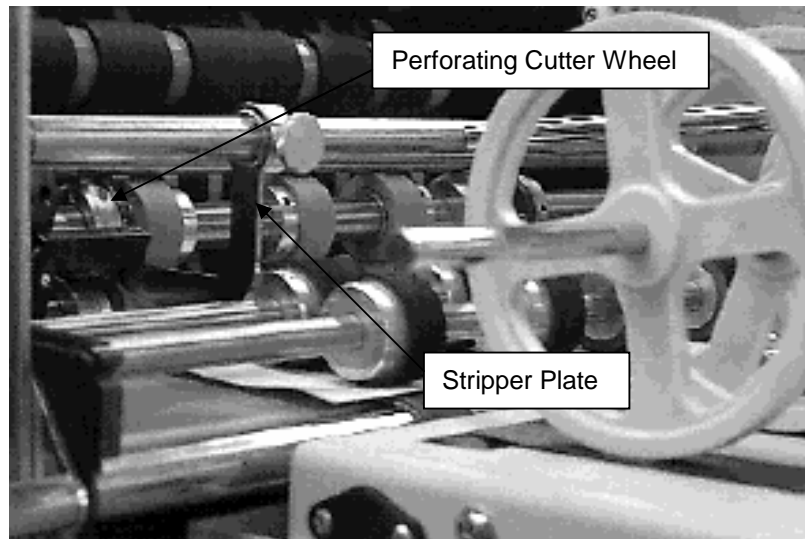
The programmable controller (PLC) controls all the functions of the system with the exception of the actual firing of the glue nozzles, which is controlled by the hhs glue system. All sensors on the system including sheet and card photoeyes connect to PLC inputs. PLC outputs control motor starting, stopping, and velocity, along with the feed clutch and the inserter door.

Control loops in the PLC monitor main feed, folder, and inserter conveyor velocity and recommend machine set speeds as necessary.

The touch screen operator interface communicates with the PLC, providing the operator with system status and information and allowing them to enter the desired system operating parameters. Starting and stopping of the system is also controlled from the operator interface.

A.5b Exit Conveyor

The Exit Conveyor is located at the output end of the folder. The mailers exiting the folder are shingle stacked on the Exit Conveyor. As each mailer exits the folder it passes through the discharge sensor, causing a signal to be



registered at the CPU. The CPU then sends a pulse to the Exit Conveyor and the Exit Conveyor moves forward. When the machine is continuously cycling, the Exit Conveyor is continuously running.

A.5c Sensor Input

With the folder and transfer conveyor running, touching the “FEED”+“ON” will turn on the feed clutch. The feed clutch remains on until the feed sensor sees the leading edge of a sheet.

If the leading edge of the paper is not seen after one rotation of the clutch, a “FEED” alarm is declared.

Once the feed sensor sees the leading edge of the paper, the batch-count decrements and the resettable total counts increment. Then the PLC checks if the batch count number has been reached or the OS-20 is single sheet cycling. If either case is true, the feeding process is stopped and the feed clutch is shut off. Otherwise, the PLC checks if continuous or noncontinuous feeding is selected. If noncontinuous feeding is selected, the feed clutch is shut off.

While the sheet passes under the double detect sensor, the voltage values received from the feed sensor are averaged to keep a nominal value of the paper's thickness. If a double feed occurs, the feed sensor voltage value will be less than one half of this running average. If the feed sensor voltage is less than one half the average feed sensor voltage for one time, the CPU declares a “DBL FEED” alarm.

The feed sensor signals the glue gun tip sealers to open when the first sheet of paper passes through.

The sheet length is also monitored as it passes under the feed sensor. If the sheet is under the feed sensor for more than a calculated distance of conveyor belt travel (three inches plus the sheet size), a “DBL FEED” alarm is declared.

IMPORTANT!

Z-Fold, Four Plate Setup Only

To prevent possible Z-fold jams, make sure the Stripper Plate is mounted as shown below. With the Stripper Plate adjacent to the perforating cutter wheel, Z-fold documents will not tend to rise with the cutter blade.

A.6 SENSORS

A.6a Feed Sensor

The feed sensor is used to detect the feeding of a sheet of paper from the feeder onto the transfer conveyor. The feed sensor is a proximity sensor that also signals the glue gun tip sealers to open when the lead edge of the sheet is detected. This sensor also verifies sheet count. When the inserter mode is turned on, the sensor detects the trailing edge of the sheet to turn the feed clutch on to pulse feed the next sheet from the singulator. Pulse feeding is activated only when insert mode is turned on.

A.6b Double Detect Sensor

The double detect sensor is ultra sonic sensor which does not require electrical adjustment. The mechanical position of the sensor is 40mm above the mounting plate +/- 2mm. The sensor determines that two sheets have been fed by a field induced between the two pages.

A.6c Feeder Encoder

The encoder is connected to the transfer drive shaft by a timing belt. The encoder sends the CPU sixty (60) pulses for every revolution of the shaft. The CPU calculates the speed at which the OS-20 is operating.

A.6e Folder Encoder

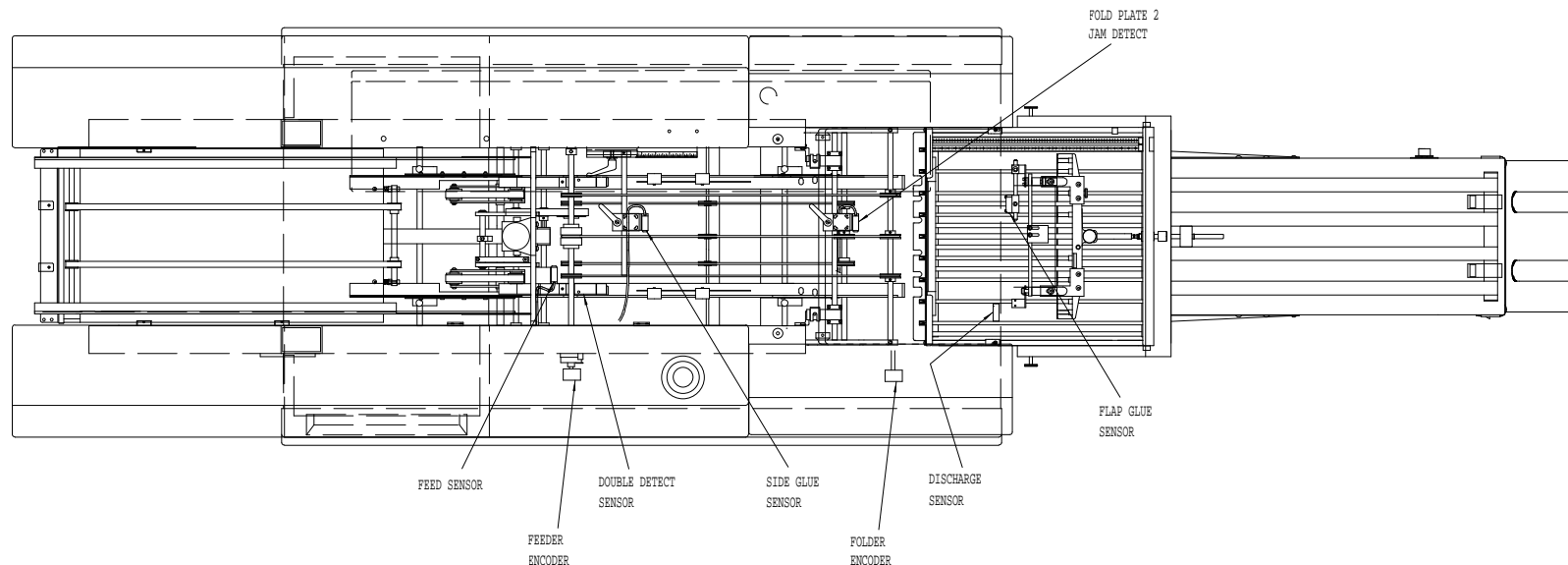
The folder encoder is connected to the folder shaft. The encoder sends the CPU 60 pulses for each revolution of the shaft. The CPU calculates the speed at which the OS-20 folder is operating.

A.6f Discharge Sensor

The discharge sensor is a proximity sensor. It is used to sense folded sheets leaving the folder and being placed onto the stacking conveyor. If the sensor is covered for too long, a "DSCH JAM" alarm is declared.

A.6g Glue Sensor

The glue sensor is a proximity sensor. These glue sensor are used to trigger glue gun activation once the leading edge of a sheet is detected. The sensor is located in the feeder section.



SECTION B OPERATION

From the main screen, pressing the job setup button will bring up 2

B.2 OPERATOR INTERFACE..... Error! Bookmark not defined.

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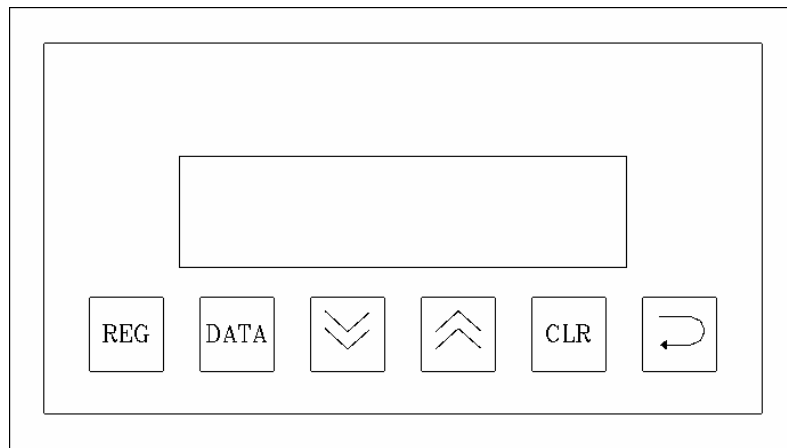
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PROGRAM PANEL FLOW CHART:**Operator Control Panel**

The operator control panel consists of 6 push buttons and a display.

The buttons are:

Home
Data
Up Arrow
Down arrow
Clear
Job Setup

Pressing the DATA button will bring up the DATA menu which shows counting information of throughput and machine faults. These counts can be reset before starting a job with the CLR button. Use the arrow buttons to scroll through the various

screens. At any time, pressing the Home button will return the play to the run screen. The screens are:

“Total Sheet’s” -This is the number of sheets that have been run since the start of the job.

“#1 Insert” -This is the number of inserts fed from Inserter #1 since the start of the job. Only with OS-8.

“#2 Insert” -This is the number of inserts fed from inserter #2 since the start of the job. Only with OS-8.

“No Feeds” -This is the number of No Feed faults which have occurred Since the start of the job.

“Doubles” -This is the number of double sheet fed errors which have occurred since the start of the job.

“Folder Jam” -This is the number of folder jam errors which have occurred since the start of the job.

“Door Jams” -This is the number of jam faults at the inserter door which have occurred since the start of the job.

“Ins & Stg Jams” -This is the number of jam faults which have occurred in the inserter(s) since the start of the job.

“Disch Jams” -This is the number of jam faults which have occurred at the output of the folder.

**FROM THE MAIN SCREEN, PRESSING THE JOB SETUP
BUTTON WILL BRING UP**

“Job Settings” on the display. From here use the arrow buttons to scroll to the following screens:

“Press Enter to Select Saved Job”-Press Enter and use the arrow buttons to scroll through jobs saved in memory. When you find the job you want press Enter again to choose that job.

“Edit Current Job”- Press Enter to get to the “Edit Job” menu. From here you can use the arrow buttons to scroll to and change the following job settings.

“Edit Job Name”

“Target Feed Rate”

“Press Enter To Set Motor Speeds”

“Feed Mode Contin/Batch”

“Insert Mode”-Set for No Inserter, Inserter 1 only, inserter 2 only Or both inserters

“Discharge Shingle”

“Page Length”

“Done” – When this screen is reached all settings have been entered. Press Enter button to get back to the “Edit Job” screen.

“Save Current Job”- Press Enter to save changes to job settings in above step.

“Delete Saved Job” - Press Enter and use arrow buttons to scroll to job you want to delete. Press Enter again to delete that job.

“Edit Advanced Settings” – Press Enter to get to Advanced Settings menu to make changes to the following machine settings.

“Double Detect” -Enable/disable double sheet detection feature

“Speed Alarms” -Enable/disable speed alarms feature

“Inserters” -Set number of inserters installed on the machine. For OS-20 it is 0

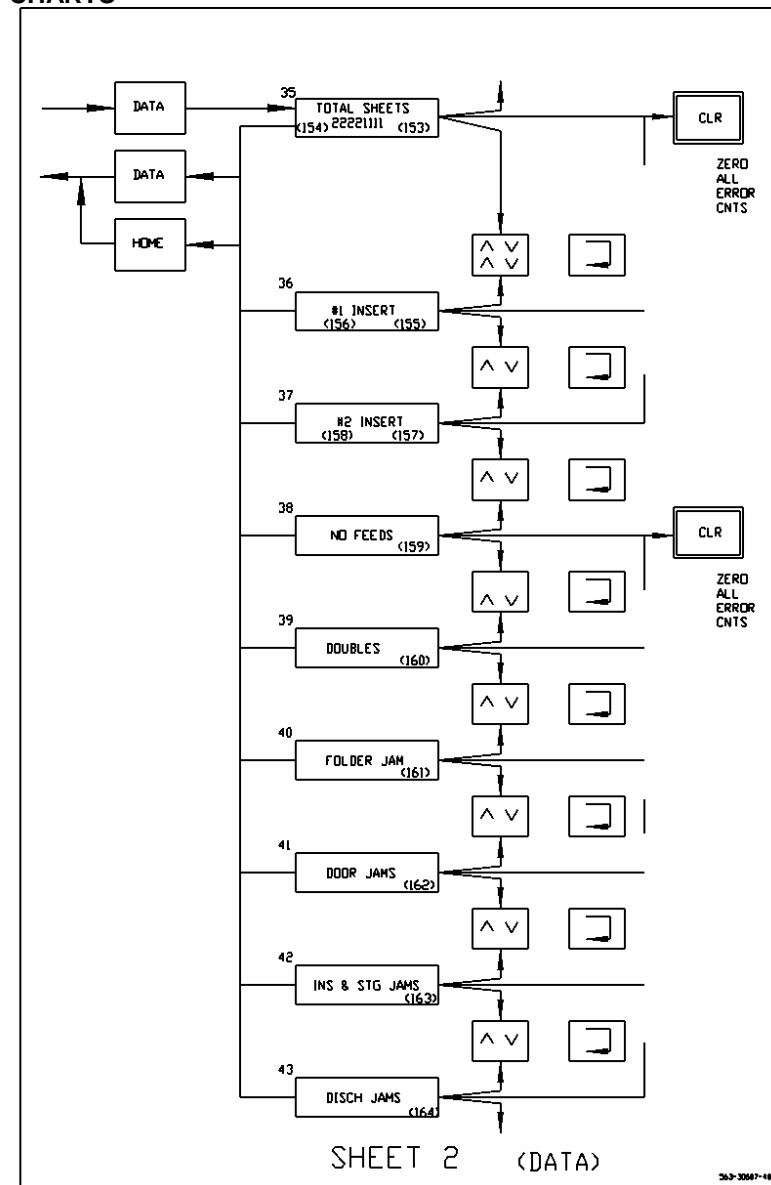
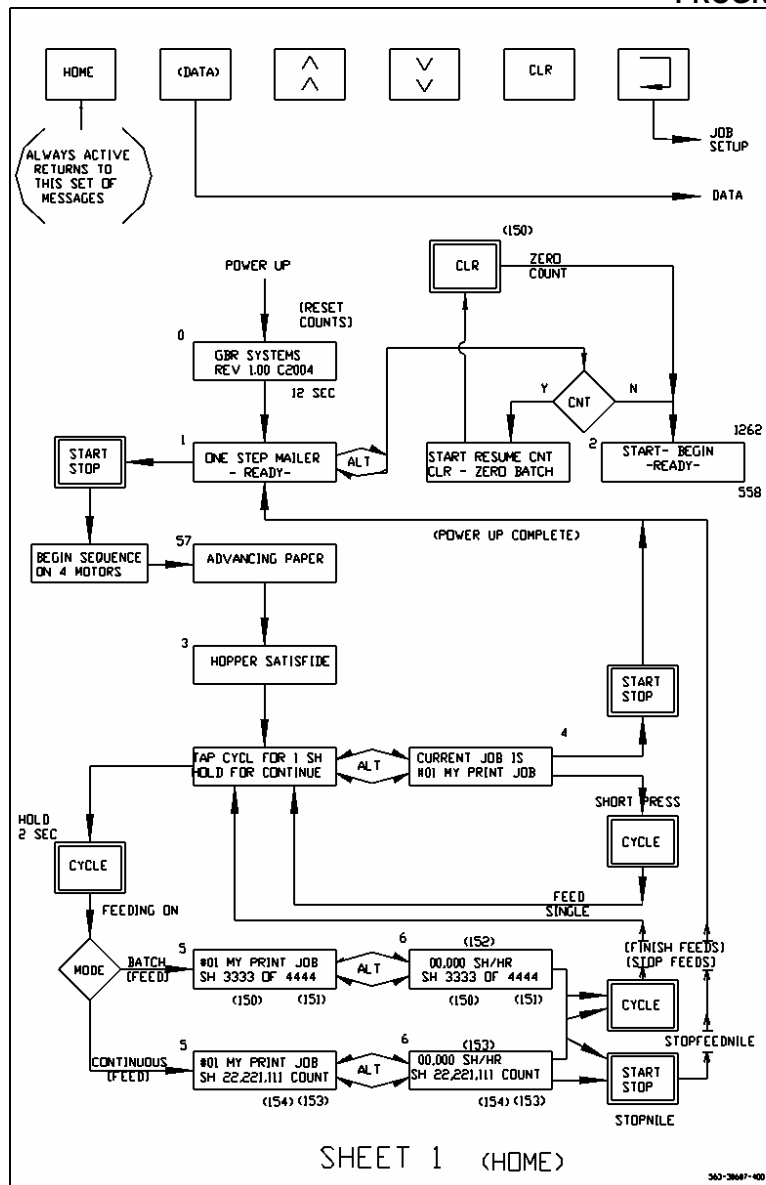
“Language”- Select language setting. Only English available at this time.

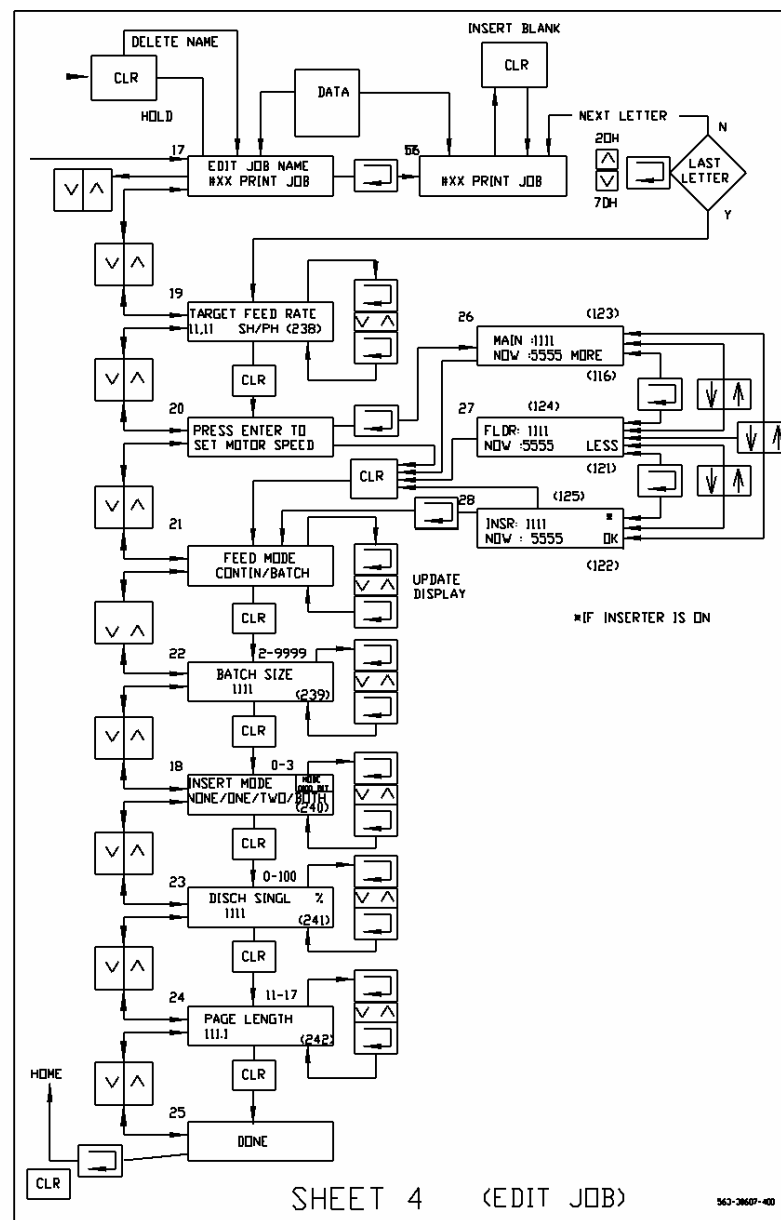
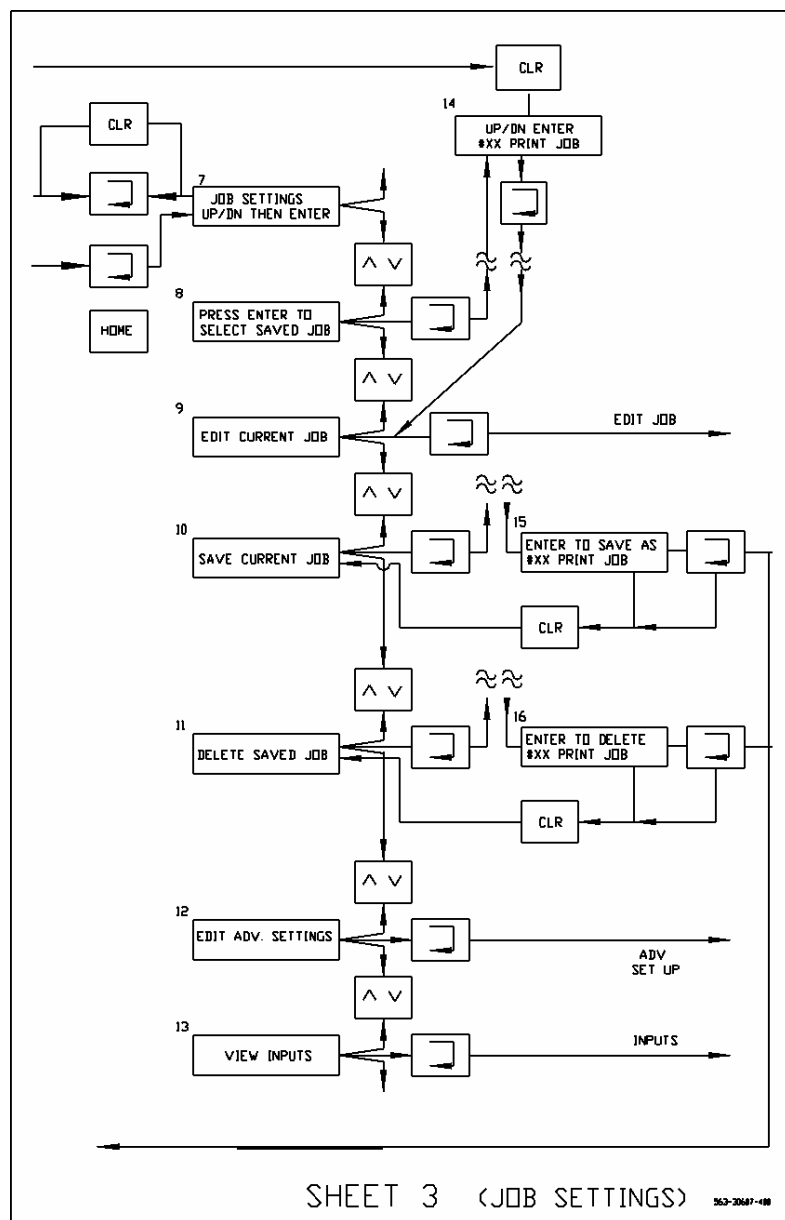
“Gap Between Sheets”-Set spacing between sheets being fed. Range of settings 1 to 10.

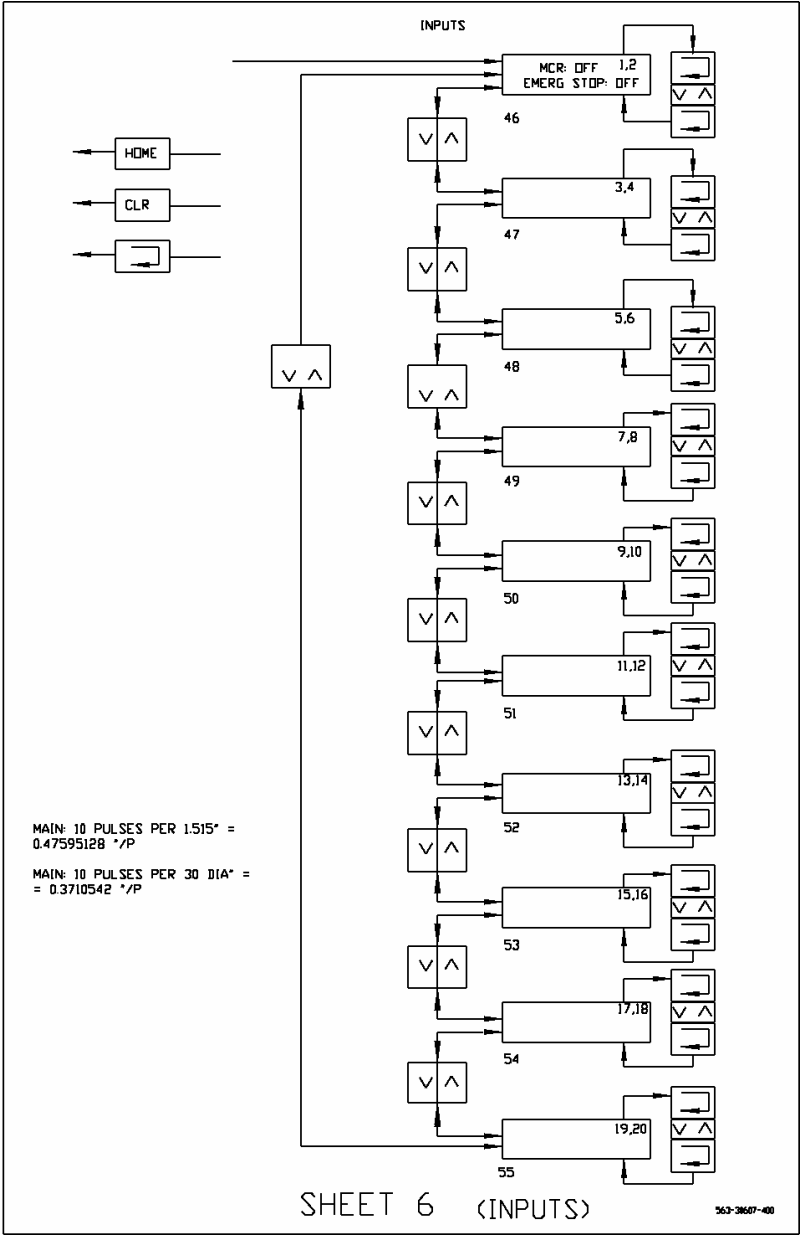
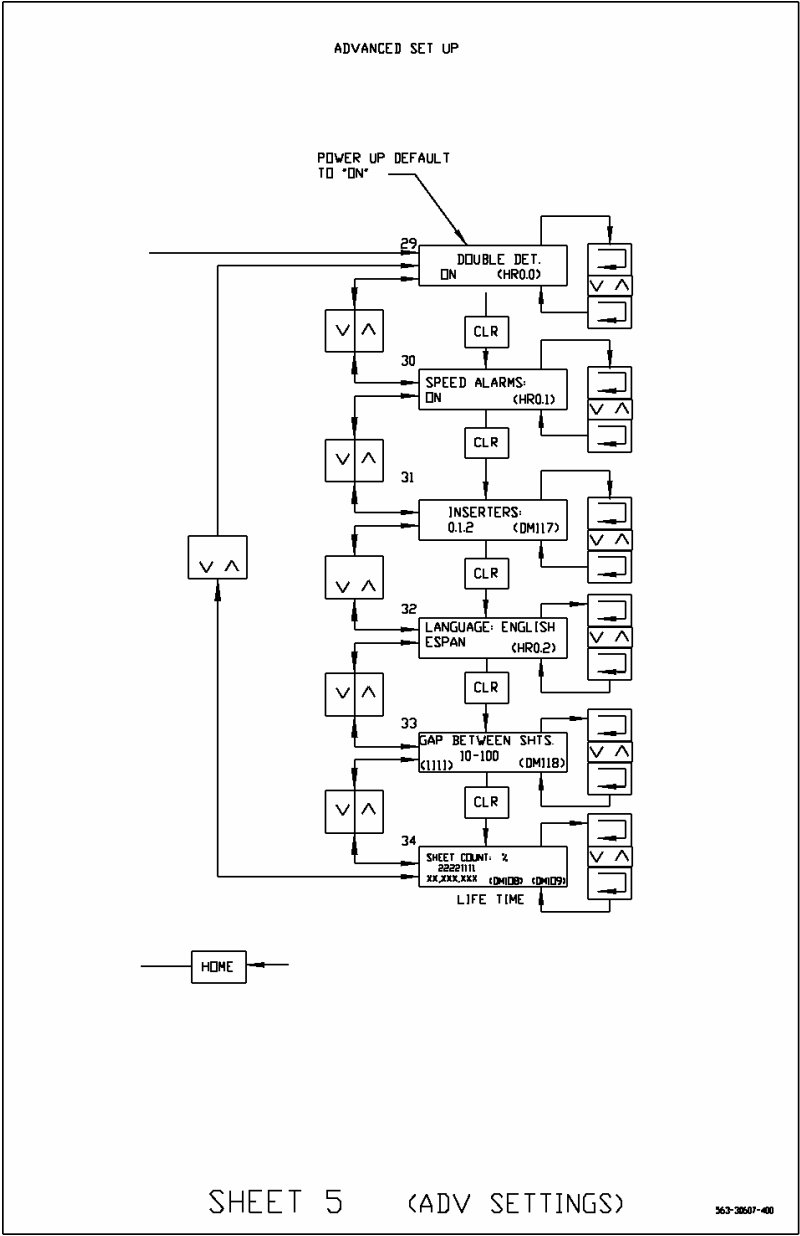
“Sheet Count”-This is a lifetime count of sheets run through the machine and can't be reset.

“View inputs”- Press Enter and use arrow buttons to scroll to various PLC inputs to test functioning of following sensors.

PROGRAM FLOW CHARTS







B.3 PREVENTATIVE MAINTENANCE RECOMMENDATION

At the end of every shift or production run it is recommended that all paper path surfaces where glue is deposited and where paper travels through the folder buckle plates and bypass plates be inspected and cleaned. Glue build up on surfaces can cause paper to stub and hesitate on the way to the folder causing timing problems and possible jams in the folder, Glue on infeed guides and buckle plate rods and stop surfaces can cause deterioration of folding performance, such as skewed folds. Glue on bypass guide surfaces will eventually cause skewed folds.

Just 5 to 10 minutes a day devoted to wipe down with a wet cloth and spudger will maintain feeding and folding performance from day to day. Don't wait until the condition gets so bad that it takes hours to clean.

NOTE: Always remember to use as little glue as possible to get the proper seal when setting up the job.

B.4 GLUE GUN ADJUSTMENT

The glue guns are adjusted mechanically at the factory for dispensing uniform glue spot size for all glue guns. Normally, mechanical adjustment of the glue guns is not necessary once they leave the factory.

If it becomes necessary to adjust any particular glue gun mechanically:

- Turn the adjusting screw clockwise to reduce the size of the glue spot
- Turn the adjusting screw counterclockwise to increase the size of the glue spot

NOTE: The Glue Shutoff Valve is a quick and convenient manual component used to shut off the flow of glue to the glue guns. This valve is used if a defective gun needs replacement or for accidental spill emergency. When the machine is sitting idle between production runs and the system is either filled with glue or clean water, the shut off valve should be turned to the "off" position. This will prevent liquid from siphoning back toward the pressure tank if the pressure drops. This will also maintain glue line pressure from the valve to the guns. This is necessary to keep all internal surfaces wet.

B.5 FILLING THE GLUE TANK

WARNING: Use rubber gloves and eye protection. Observe caution when opening and pouring glue.

The glue tank level should be checked daily, and refilled when the reservoir is $\frac{3}{4}$ empty. The following instructions will assure that the glue tank is correctly filled, and the unused glue is properly cared for.

CAUTION: The glue tank is precisely machined to maintain a secure seal. When handling the glue tank and its components, be careful to avoid damage.

STEP 1: Place the glue tank on the floor next to the OS-20, making sure not to over extend or tangle the air and glue tubing.

STEP 2: Lift up and rotate tank cover lock handle.

CAUTION: Make sure all air pressure is relieved from tank before opening.

Rotate cover 90° and tilt cover to vertical orientation.

STEP 3: Remove glue tank cover and place glue tank cover on a clean surface. Make sure rubber seal is clean and free of glue.

STEP 4: Remove cap from glue container. Carefully pour glue into tank. Fill to a level appropriate for the job. The minimum amount of glue for a single fill is a $\frac{1}{2}$ gallon.

CAUTION: Always keep sealing surfaces clean and free of glue.

STEP 5: Reseal the glue tank by pressing down on cover locking handle. Make sure uniform alignment and fit is maintained during the locking motion.

Glue Storage:

- **Unopened container shelf-life is about 6 months if stored in a cool location (65 - 72°)**
- **Before using glue, it is good practice to mix thoroughly: hand tumble the gallon container for a few minutes to mix the glue thoroughly.**

- When glue goes bad it will smell bad.

B.6 PURGING THE GLUE GUNS

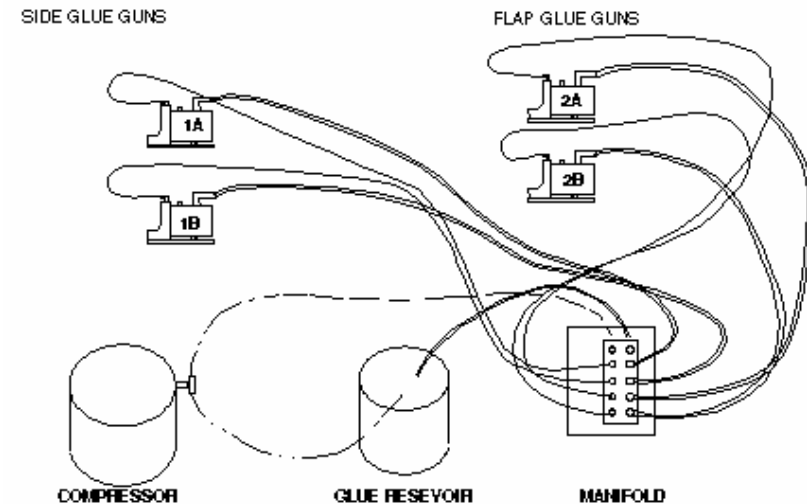
WARNING: Use rubber gloves and eye protection. Observe caution when opening and pouring glue.

When the machine is to be idle for more than 3 days the glue system should be flushed or purged.

1. Close the shut off valve on the compressor.
2. Open the bleed regulator valve. Pulling up the air relief valve on the tank cover expels any residual air.
3. Fill the water tank with warm water.
4. Close and secure the glue tank cover.
5. Open the compressor shut off valve, allowing the glue tank to build up pressure to 30 PSI.
6. Place flushing hose in bucket
7. Open the purge valve on the glue system stand.
8. Run water until lines are clean with no glue residue.
9. Make sure that clear water flows from the flush hose before completing the flush.
10. Close the purge valve then use the controller to purge each glue gun.
11. If equipped with Z-fold option, repeat steps 8 through 12 for other glue gun manifold.
12. Always leave water or glue continuously pressurized in the system.

CAUTION

NOTE: You can leave the glue in the system without running the M-40 for up to 3 days without cleaning. However, it is better to clean the system if this is the interval between jobs.



Glue System Diagram

B.7 COMPRESSOR OPERATION

B.7a Startup

CAUTION: Do not operate the compressor at ambient temperatures exceeding 35°C/95°F as this may cause overheating. Ensure that adequate ventilation is available during operation.

SAFETY

- Do not adjust the pressure switch to a higher pressure than the factory set pressure.
 - Do not in any way block or prevent the normal functioning of the safety relief valve on the receiver.
 - The valve is factory set and the sealing must never be broken. Only connect pneumatic equipment suitable for maximum pressure indicated.
 - Do not touch compressor motor during operation as there is a risk of burn due to high temperature (approximately 80°C/176°F).
 - Do not direct airflow at head or body.
1. Start the compressor using the ON/OFF switch on the pressure switch. The compressor will automatically switch off at the preset pressure. If the motor does not start it may be due to pressure in the receiver, and the motor will then start automatically when the pressure reduces to approximately 6 bar/87 PSI.

HANDLING

- Always keep the compressor in a upright position.

B.7b Fault finding and Repair

IMPORTANT!

1. Switch off and disconnect main power to the machine before removing any parts from the compressor.
2. Empty air receiver of air before dismantling any parts of compressor unit's pressure system.

1. Compressor does not start:

- a) No power from mains. Check fuses and plug.
- b) Breakage or loose joints in electrical connections
- c) The starting relay is defective. Contact GBR Systems Corporation.
- d) The pressure switch is defective and does not switch on the compressor.

- e) The thermal protection has switched off the compressor due to overheating. When cooled, the compressor will automatically turn on at a suitable operation temperature. Go through the points in section E.
- f) Pressure in the air receiver is too high for activation of the pressure switch. The pressure switch makes circuit only when pressure has dropped to preset start pressure. Empty the air receiver.
- g) The compressor has not been emptied of air and there is backpressure on the piston. Dismount and check relief valve. The backpressure may be due to a leaking non-return valve causing the compressed air in the receiver to leak back into the compressor motor. Dismount the non-return valve and change O-ring.

2. Compressor operates, but pressure does not increase in tank (or increases too slowly):

- a) Intake filter is clogged. Clean or replace the filter element.
- b) Leaks in fittings, tubes or pneumatic equipment. Check with soapy water.
- c) Clogged non-return valve or pressure pipe. Clean or replace the parts.
- d) Air leaks from the relief valve when the compressor is operating. Check or replace the relief valve.
- e) Defective valve plate. Contact GBR Systems Corporation.

3. Compressor gets very hot

- a) Air leaks. See point 2d.
- d) Clogged intake filter. See point 2a.
- e) Too high ambient temperature.
- f) The compressor is overloaded (i.e. it is on more than 50% of the operation time). Contact GBR Systems Corporation.

4. Compressor starts when no air is being used:

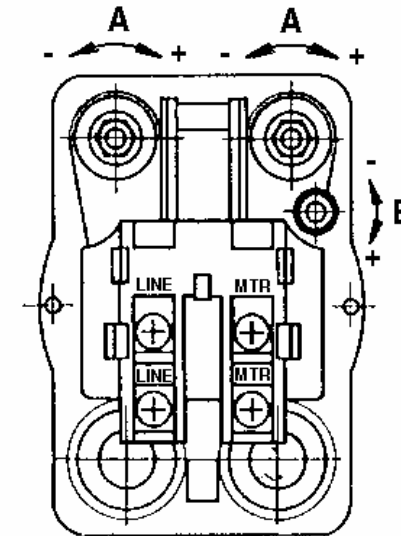
- a) Leaks. See point 2b

5. Compressor starts and stops more frequently than usual

- a) Leaks. See point 2b

6. Pressure in air receiver does not reach 8 bar/120 psi

- a) The pressure switch is not adjusted correctly. Adjust as follows:
Adjustment of pressure switch:
A: Maximum pressure adjustment (cut-out)
B: Differential adjustment (cut-in)
- b) The cut-in pressure is set by adjustment of differential screw B. Turn clockwise to reduce switch-on pressure.



- c) The cut-out pressure is set by even adjustment of the two screws A. (Cut-in pressure + differential = cut-out pressure). Turn clockwise to increase cut-out pressure. The switch is normally factory set for operation at 6-8 bar (approximately 0-120 psi). See figure below.

Pressure Switch

| Maintenance Table | Weekly | Monthly | Annual |
|---|--------|---------|--------|
| | | | |
| Check compressor, air tubes and equipment for leaks and check pumping time. | | * | |
| Inspect, clean or replace intake filter. | | * | |
| Clean the compressor with a soft, damp cloth. Dust and dirt prevent cooling. | | * | |
| Test the safety valve by gently pulling protruding rod with ring attached. | | | * |
| Check regulator filters for contaminants and clean. | | * | |
| Check the O-ring in the check valve and replace if necessary. NOTE: Empty receiver of air before dismounting. | | | * |

SECTION C MAINTENANCE

| | | |
|------------|--|----------|
| C.1 | DAILY MACHINE MAINTENANCE DUTIES | 2 |
| C.2 | Bimonthly Machine Maintenance Duties..... | 4 |
| C.3 | Extended Shutdown And Reactivation | 5 |
| C.4 | Authorized Outside Service | 7 |
| C.6a | Feeder Alarms..... | 7 |
| C.6b | Folder Alarms..... | 7 |

Operator maintenance is critical to efficient operation of the OS-20.

Operational adjustments of machine components and daily machine maintenance require only a few moments and are easily performed. The requirements of glue reservoir replenishment and checking of the glue system are essential daily tasks which, if done consistently, serve to reduce overall maintenance costs and provide maximum productivity.

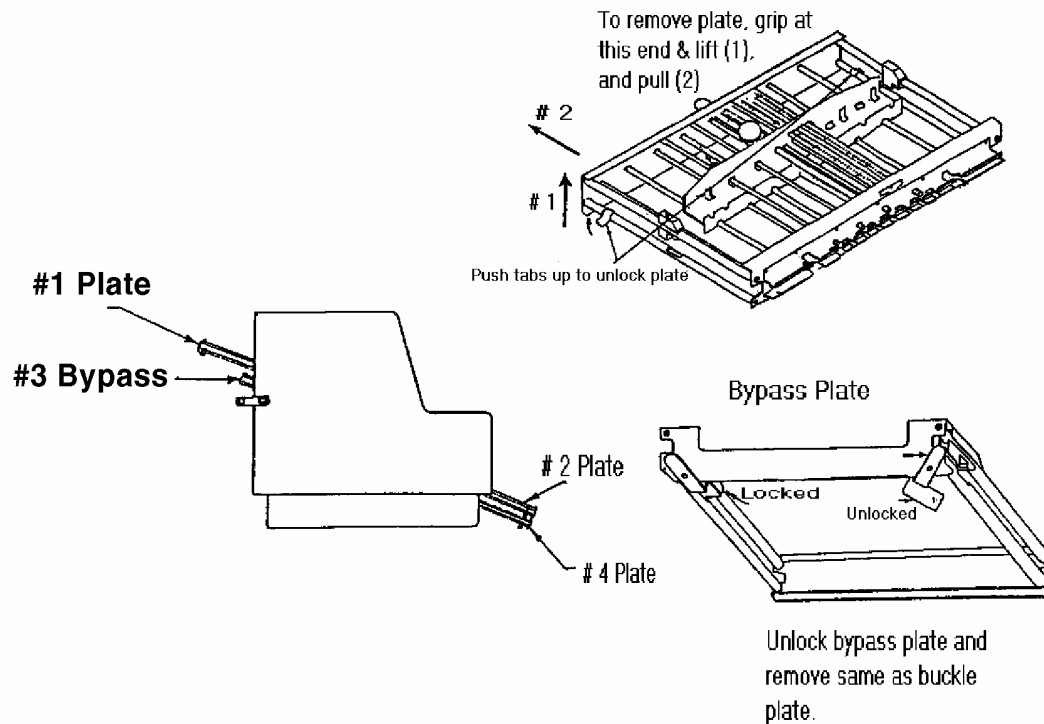
The daily and bimonthly operational duties have been divided into convenient subsections for quick reference and assignment. Also, in order to provide a clear definition of responsibilities, GBR Systems has listed activities that go beyond that of the operator and into the area of outside service maintenance.

- Daily Machine Maintenance Duties
- Part Maintenance
- Bimonthly Machine Maintenance Duties
- Purging the Glue Guns
- Extended Shutdown Period and Reactivation
- Authorized Outside Service

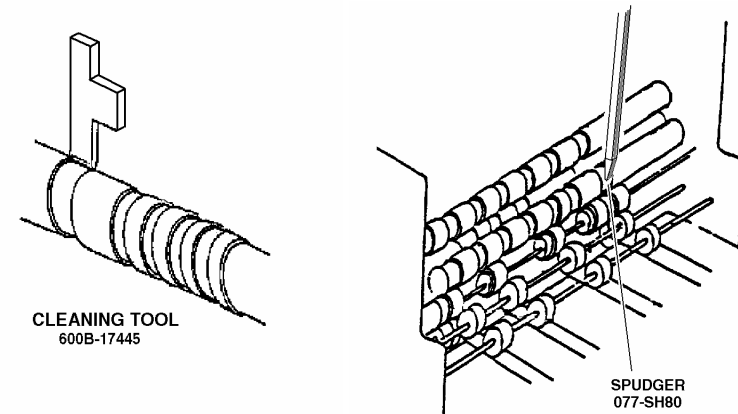
C.1 DAILY MACHINE MAINTENANCE DUTIES

At the beginning of each day of operation the following simple steps should be followed:

- Perform folder and glue cleanup procedures
- Purge the side glue guns (see Section B)
- Purge the flap glue nozzles (see Section B)
- Return the glue settings to normal start of day settings
- Run several sample documents to check quality
- Reset the batch counter in batch code

1. Remove buckle plates and the bypass plates.**Fold Plate Removal****2. Clean the folder with Spudger and Cleaning Tool.**

Inspect all undercut areas in the rollers for glue build up and carefully remove the glue residue. The areas that are in line with the side glue guns and the flap glue dots have been covered with a nonstick tape to make cleaning as easy as possible. Special tools called a Spudger and a Cleaning Tool are shipped with each machine for the operator to use. These tools gently remove the glue buildup on the taped areas and any other paper path surfaces.

**Fold Roller Cleaning Tools**

NOTE: Rotate folder rollers using the large red knob on the right side of the folder in the direction of the arrows embossed on the knob. Proper rotation of the folder rollers will prevent damage to the tape.

After removing as much dried glue from the folder rollers as is possible, wipe all folder rollers with a cloth. Partially saturate the cloth with warm water, to wet down the rollers. The wetting procedure is necessary to soften the hardened glue and permit easier removal. Leave the folder rollers wet while doing the following steps: this will facilitate roller cleanup.

3. Clean the folder infeeds and polish with silicone spray.

Each folder buckle plate infeed guide and bypass deflector will need to be inspected for residual glue buildup in the areas which are in line with the glue placement on the documents. If inspection reveals that glue has built up in any of these areas it will have to be removed.

CAUTION: The use of a metal object to clean the folder buckle plate infeed guides will cause damage and degrade the performance of the OS-20 It is generally recommended to use a damp soft cloth and the Spudger.

IMPORTANT! The infeed plates on each buckle plate are designed to permit easy guidance into the buckle plate. If there is hardened glue buildup it may create resistance to the paper and premature buckling may occur, resulting in incorrect folds. After cleaning the infeeds it is an acceptable practice to coat them with a light silicone spray and then polish to produce a smooth finish. The silicone will inhibit build up and improve the paper guidance.

4. Clean the folder rollers.



WARNING: Extremely sharp blades. Cutting hazard.
Keeps hands away from slitter knives. Remove power first. Never attempt to clean rollers when folder is on.

The knives that perforate the sides of the folded document are sharp and can cause injury. When removing buckle plates or when cleaning the folder rollers, please use extreme caution. Use the special tools to minimize danger. Because the folder rollers will be subjected to processing documents with wet glue on them it is imperative that they be kept clean. The action of the glue on the folder rollers was foremost in the selection and development of the formulation of the glue product. It is water-soluble and removes easily from the folder rollers with a wet cloth. In this maintenance procedure it was earlier suggested that the folder rollers be dampened with a wet cloth to soften the hardened glue. At this time the glue should be soft enough to permit easy removal. Extra care and attention should be exercised to keep the folder rollers meticulously clean for optimum production.

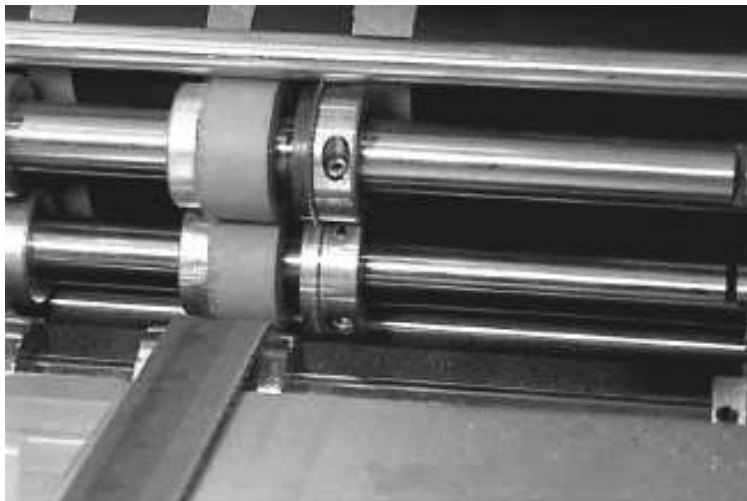
Inspect all tape surfaces for cleaning damage and replace any section where damage has taken place. **Wrap two turns on deep groove rollers and one and a half turns on shallow groove rollers.**

CAUTION: Use only the large red knob on the side of the folder to turn the folder rollers. Do not turn power on with cleaning materials inside or near the folder rollers.

5. Replace buckle plates and the bypass plates.

C.3 BIMONTHLY MACHINE MAINTENANCE DUTIES

1. Check the Condition of Perforation Knives. Inspect perforation knives by looking at the quality of the perforation on the sides of folded documents. This inspection is based on expected quality of the finished document more than any precise setting. The perforation wheels at the exit of the folder can be adjusted to increase or decrease depth of penetration. Perforation depth is set at the factory to permit the perforated side of the document to separate from the main body of the document with relative ease. New perforation wheels tend to penetrate cleanly, with little or no crushing. Worn or damaged wheels will produce less cutting of the paper fibers, merely crushing the paper. This makes it increasingly difficult to remove the perforated sides.

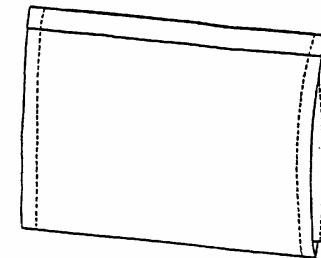


Perforating Knives



WARNING: Extremely sharp blades. Cutting hazard. Keep hands away from slitter knives. Remove power first. Never attempt to clean rollers when folder is on.

2. Check document for square folds. Documents that are sent into the folder exactly perpendicular to the folder rollers will fold perfectly square provided the stop bar in the buckle plate is also square. The feeder's paper guide rails play an important role in the presentation of the document to the folder. **Inspection of the alignment table geometry is possible by using plain xerographic paper. The paper is fed into the alignment table as normal and the output is observed for square folding. If the output has not been squarely folded,** it is probable that the feed conveyor did not present the document squarely. Screws that secure the paper guide rails to the crossbars can be loosened. These permit the operator to adjust the guide rails to their desired location and change the angle of the document presentation to the folder.

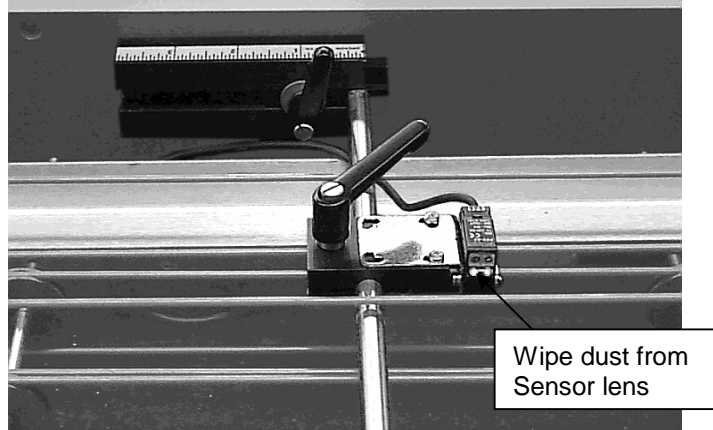


Bad or Incorrect Fold

Note: When pre-perforated stock is used the folder will tend to fold on the perforations even if the presentation is slightly angular. And if the document stock has not been perforated squarely it may not be possible to fold it square even with adjustment of the alignment sphere drive assembly. Be sure the documents have been perforated correctly before making any adjustment.

3. Check for centered document. The folder rollers, having been undercut in specific places, require that the document be presented to the folder exactly on center. If the document is not centered precisely the side glue will not be located on the document in the correct position. Presentation of the document may be adjusted by moving the paper guide rails.

4. Clean the glue activation sensors. Each sensor has a small infrared emitter/receiver. When paper is present the computer detects an electrical change. As paper dust buildup occurs it reduces the sensor's sensitivity, possibly giving incorrect indications. Inspection of each sensor and wiping of the lens will return the sensor to its original efficiency.



Glue Activation Sensor

Suggested procedure to achieve square folds

- A. Adjust infeed roller tension so that when one sheet is between the rollers there is the most minimal amount of tension. Ideally, the rollers should be able to rotate without moving the paper.
- B. Spread the infeed paper guides to their maximum width.
- C. Square the side rails to the side frames. (Hand feed a sheet of paper through the transport area and ensure that the leading edge of paper contacts the folder roller squarely. If not, readjust the side rails.)
- D. Adjust the paper infeed guides to match the side rails. The infeed guide's width should be equivalent to the width of the paper stock. (Hand feed a sheet of paper through the transport and ensure that the leading edge of paper contacts the rollers square and at the pinch point of the rollers.)
- E. Adjust the paper hold-downs so that no friction is achieved when the paper passes underneath. If the paper stalls in this area, raise the hold-downs accordingly.

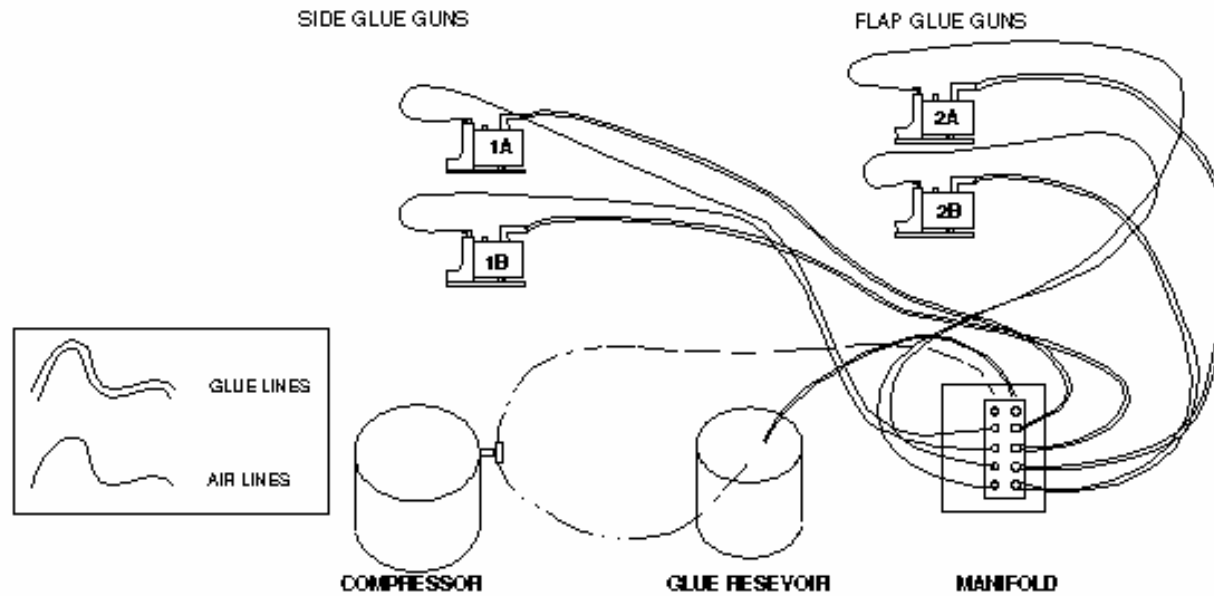
- F. Square the buckle plates being utilized. This is accomplished by measuring from the buckle plate backstop to the buckle plate infeed guides. Measure both the right and left side and insure they are equivalent.

C.5 EXTENDED SHUTDOWN AND REACTIVATION

NOTE: This activity is necessary only when the OS-20 is scheduled to be put off-line and remain unused for greater than one week.

During periods of extended shutdown (3 days or more), both the side and flap glue systems should be purged of glue by flushing with warm clean water. Water should be left in the system, under pressure, during the extended shutdown period. This will help to keep the lines and valves moist. Before loading glue in the system after an extended shutdown period, first purge all residual water from the glue lines. Refer to section B.5.

Note: Residual water that is not removed from the glue system will lower the viscosity of the glue resulting in poorly glued packages.



Glue System Schematic

NOTE: All glue guns should be flushed clean and filled with water and pressured when machine is not used for extended periods of time - -3 days or more.

C.6 AUTHORIZED OUTSIDE SERVICE

If a problem continues after reviewing operator adjustments, request support from a Customer Service Engineer. Use the following guidelines to aid in determining what is wrong and what may need to be done.

Determine which subsystem of the OS-20 exhibits the problem. The alarm messages displayed on the OS-20 operator interface indicate to the operator which subsystem is affected:

- Feeder
- Folder
- Glue System
- Stacking Conveyor

C.6a Feeder Alarms

DBL FEED

First, ensure that the sensors are not dusty and are adjusted properly, especially the double detect sensor.

If this alarm occurs and two pages were actually fed:

- Singulator roller is too high
- Auxiliary feed belts are too high
- Double detect sensor is too high
- Paper hopper is not positioned properly

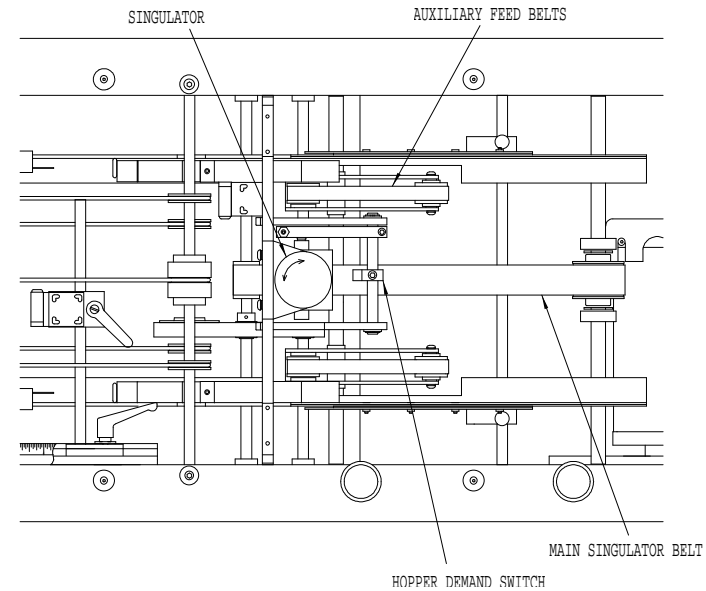
Any one of these areas could be out of adjustment, or a combination of adjustments could be incorrect. Refer to Section D of this manual for correct adjustment/s.

FEED ALARM

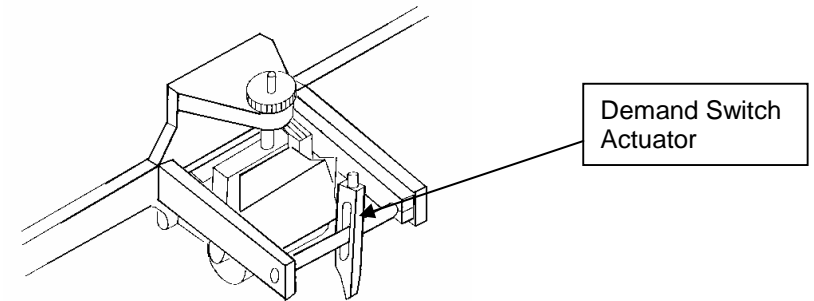
If this alarm displays and no paper was fed from the feeder:

- Singulator roller is too tight
- Paper hopper demand switch is too low
- Paper hopper is not positioned properly

Note: If the display indicates either of the above messages and one page was fed, then the problem may require technical expertise beyond the scope of the operator. Outside intervention by a qualified experienced technician.



Feeder Area



Singulator and Demand Switch

C.6b Folder Alarms

The following alarm indicates that the operator needs to check and clear the Folder of jammed or out of place documents.

DISCHARGE SENSOR JAM

If inspection reveals that there is no paper jammed in the folder and the display persists, then contact the Customer Service Engineer.

NOTES:

SECTION D ADJUSTMENTS

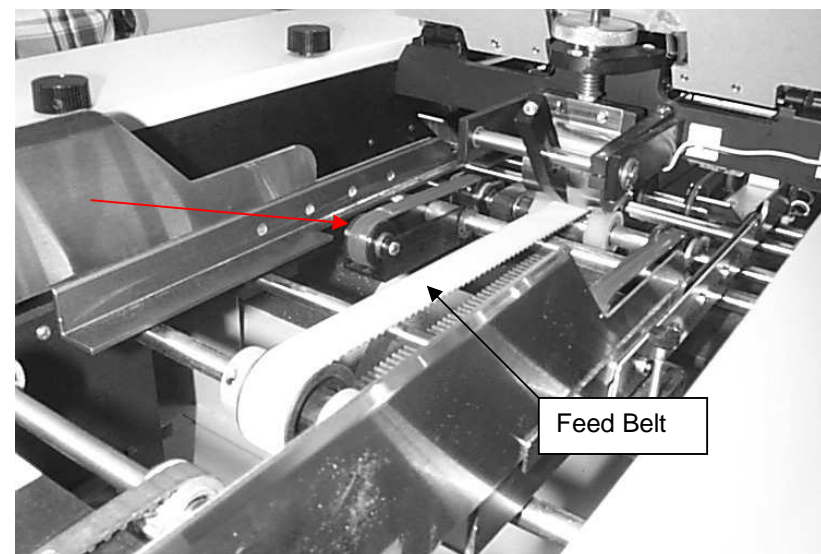
| | | |
|------------|---|----------|
| D.1 | FEEDER..... | 1 |
| D.1a | Centering of the Feed Belt..... | 2 |
| D.1b | Setting Feed Belt Tension..... | 2 |
| D.1c | Auxiliary Feed Belts..... | 2 |
| D.1d | Singulating area | 3 |
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| D.2 | FOLDER | 6 |
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D.1 FEEDER

Mechanical adjustments may be necessary when changing document types or if document-handling errors persist.

Follow the step sequence provided here to save time and prevent repeating an adjustment that has been already made.

The following items must be aligned in the center of the Feeder using a scale. Because many of these parts are nearly an inch in width, the exact center may be hard to determine. This problem can be avoided by making the measurement from the outside edge of the part being centered, to the inside of the frame. When the measurement from one side of the part to the frame is equal to the measurement from the other side of the part to the opposite side frame, the part is centered.



Feed Belt on Feeder

D.1a Centering of the Feed Belt

NOTE: It is recommended that the feed belt be centered first.

1. Loosen the screws that secure the creeper conveyor.
2. Move the creeper conveyor back to expose the entire feed belt. The yellow flanged timing pulley is what keeps the feed belt on center.
3. Using the method previously described, check the centering of the yellow timing pulley. If the distance is found to be greater on one side than the other, the pulley is not on center and has to be moved in the direction of the greater measurement.
4. To move the pulley, the lock collars have to be loosened.
5. When retightening the lock collars, make sure the part is centered and leave a small amount of space so that the pulley can spin freely.
6. Check the pulley at the front end of the feed belt. (If the feed belt has been turning and the black idler timing pulley was only moved a small amount to center, the front-end pulley can be centered visually off the feed belt.

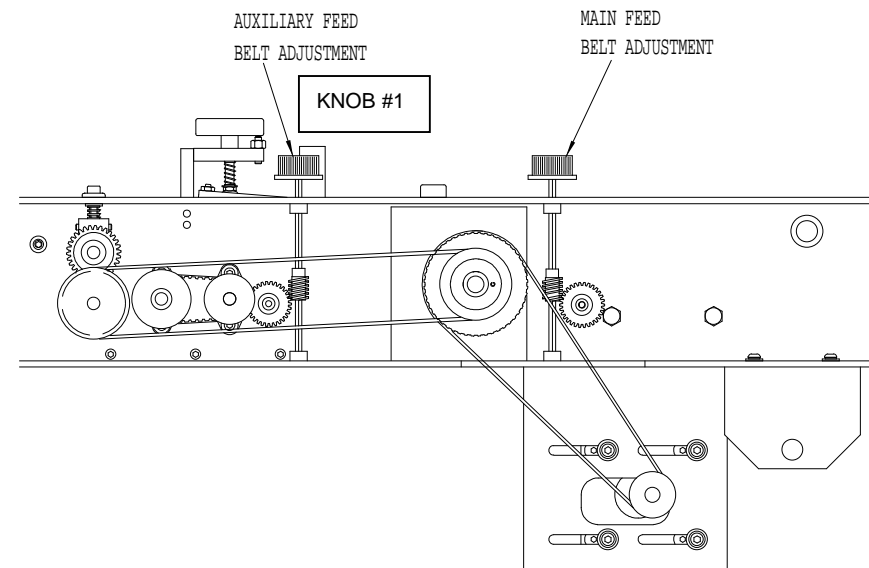
D.1b Setting Feed Belt Tension

The Feed Belt provides the primary force separating a sheet from the bottom of the shingled stack. The setup procedure for this belt is described below. The Feed Belt tension adjustment knob is factory set, limited to approximately 3/4 turn. This is adequate operator adjustment for typical paper weight variations. If the Feed Belt is replaced:

1. Loosen the long setscrew (3/32") on the top stop collar of the Feed Belt tension knob shaft.
2. Lay a straight edge across the top of the Feed belt (lengthwise). Make sure it lies across both pulleys.
3. Adjust the Feed Belt tension knob so 3/16 inch Feed Belt deflection is possible in the middle of the belt.
4. Now turn the Tension Knob 3/8 turn CCW.
5. Slide the stop collar to the top of the Tension Knob shaft. Position collar so the long set screw is perpendicular to the side frame. Tighten setscrew to the Tension Knob shaft. This will again limit adjustment to 3/4 turn.

D.1c Auxiliary Feed Belts

The red auxiliary feed belts support and help feed the bottom shingle stacked sheet. These belts can be tilted lengthwise to assist in the singulation of sheets. Different paper types with different moisture content require different settings. The red auxiliary feed belts are adjustable by angling the back end up or down. Knob #1 adjusts the belt. Turning the knob clockwise lowers the rear end of the auxiliary drive belts, turning the knob counterclockwise raises the rear end of the belts. The ideal setting for the auxiliary belts is when the back end is raised just above the main feed belt. A good starting point for the Auxiliary belt position is accomplished by placing a straight edge between the two Auxiliary feed belts at the midpoint of the idler pulleys. The straight edge should almost touch the tan Feed Belt (approximately 1 paper thickness) and be parallel to the surface of the Feed Belt.



Feeder Belt Adjustments Knobs

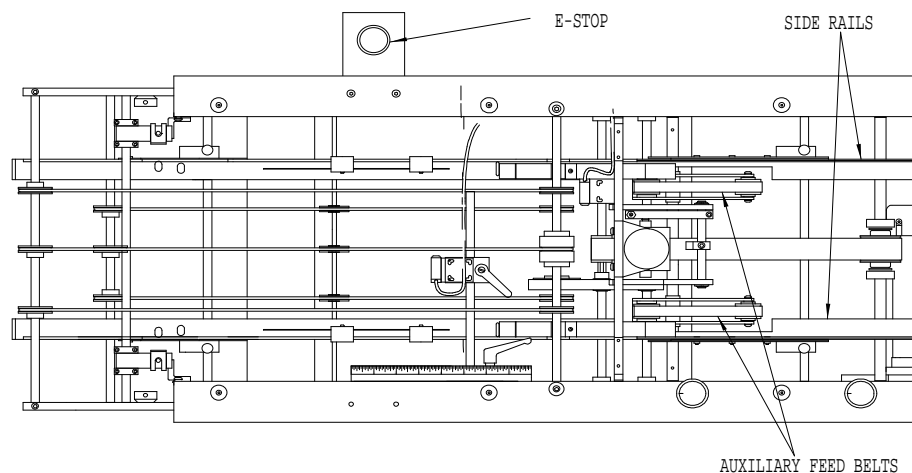
D.1d Singulating area

The singulating area takes sheets fed in by the Creeping Conveyor and separates a single sheet from the bottom of the shingled stack. The critical adjustments in this area are:

- Positioning of singulator side rails
- Feed belt tension
- Position of Auxiliary feed belts
- Singulating Roller adjustments

D.1e Positioning the Singulator Side Rails

The Singulator side rails direct paper past the singulator and on to the Alignment table. Like the Creeper Conveyor side rails, they need to be adjusted when the paper width changes.



Side Rail Adjustment

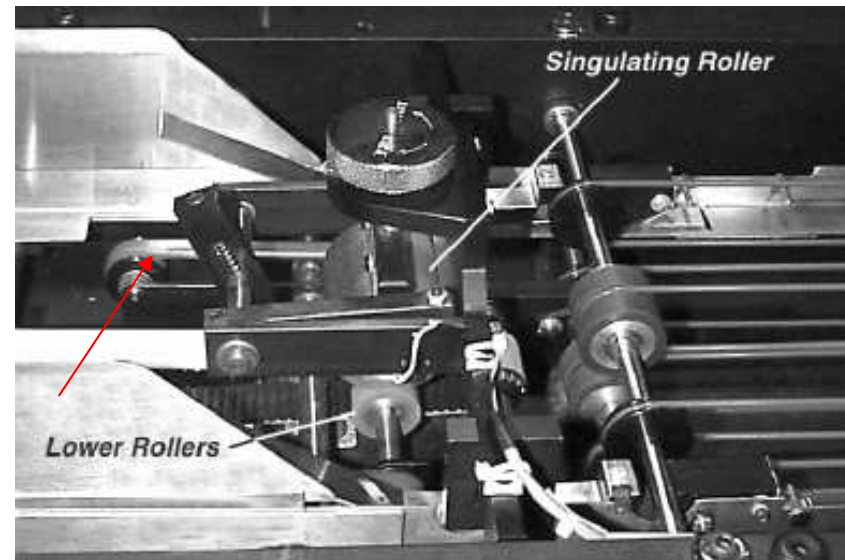
1. Loosen the four thumbscrew knobs holding the side rails in position.
2. Release the lock lever at the end of the creeper conveyor.
3. Position a sheet of paper in singulator area and move the side rails to obtain 1/16" lateral motion of the paper along the entire length of the rails.
4. Tighten the sides in position.

NOTE: Be sure the side rails are feeding the paper parallel to the Singulator Roller (i.e.: each rail must be parallel to the sides of the Singulator Roller).

D.1f Singulator Roller

The singulating Roller creates a precise singulating gap. There are three critical adjustments required to get a precise singulating gap. These adjustments are:

- Vertical Position of Singulating Roller
- Singulating Roller parallel with lower rollers
- Occasional rotation of Singulating Roller



Singulator Rollers

NOTE: All singulator roller adjustments described are nominal. The exact operating environment, paper characteristics, etc. will indicate if these adjustments should be refined for any particular document run.

D.1fa Position of Singulator Roller

The position of the Singulating Roller with respect to the two rollers on the lower shaft is critical. This spacing creates the singulating gateway. The setup process is as follows:

1. Remove paper from singulating Area
2. Raise the Singulating Roller so one sheet of paper can easily pass under the roller. (Use chrome-knurled knob)
3. Ensure the Main Feed Belt tension is correct (firm).
4. Place a single document under the Singulating Roller.
5. Slide the document back and forth while slowly lowering the Singulating Roller with the chrome knurled knob.
6. When the document starts to bow as you push it under the Singulating Roller you are within a few clicks of the proper singulation adjustment.
7. Load the singulation area with paper and test feed paper.
8. This will tell you if you need to lower the Singulating Roller if more than one sheet is fed, lower the Singulator two knob clicks. If after adjusting as many as five knob clicks proper feeding is not obtained, then all of the setup procedures for the singulator should be reviewed.

D.1fb Set Singulator Roller Parallel to Lower Rollers

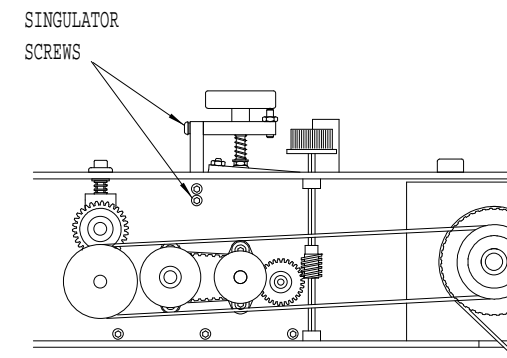
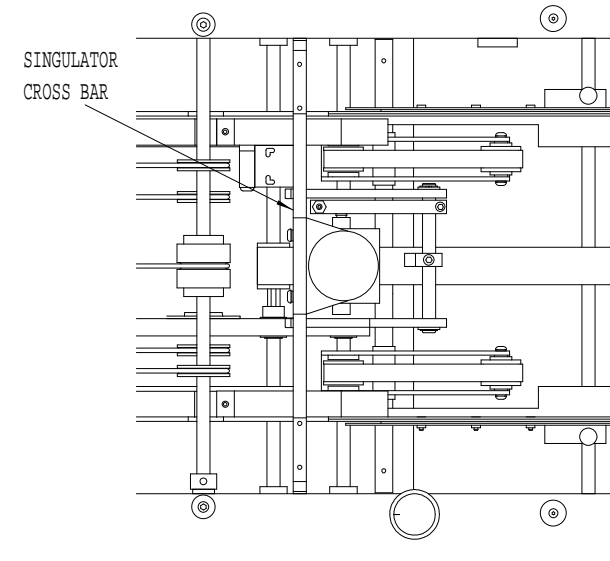
The precise gap created by the Singulating Roller and the two lower rollers must be equivalent for both of the rollers. The procedure for testing and making the adjustment is described below.

Note: This adjustment ensures a uniform gate opening. It is normally done only when a new Singulating Roller is installed or to check for uneven wear on the lower rollers. It should not be adjusted experimentally; i.e., without need.

1. Cut two strips of paper from the same document (approximately 1/2" x 8").
2. Put them between the two lower rollers and the large Singulating Roller.
3. Adjust Singulating Roller until light tension is felt on the paper between the rollers.
4. Check that the tension on both strips of paper is the same. If it is not the same, then adjust the geometry of the Singulating Roller.
5. Loosen the screws (4) on the cross bar or the chassis. Adjust either to best advantage.
 - a. Carefully position the singulator, using the small amount of play available, to raise the side of the singulator that has the most tension.

- b. Tighten the screws loosened at the start of this step.

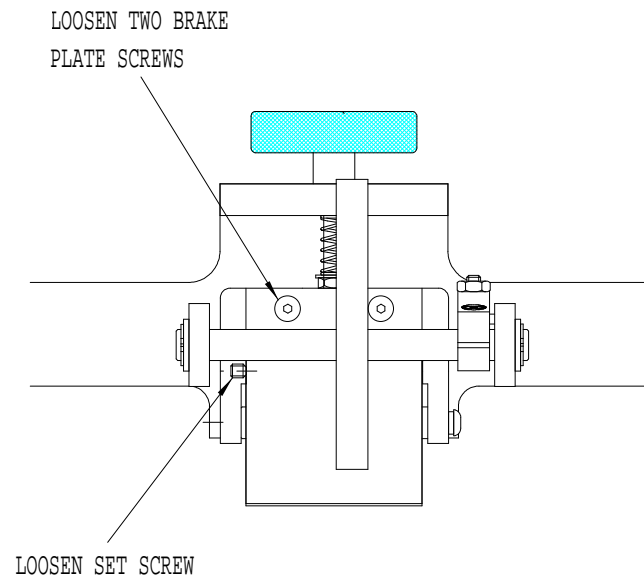
6. Retest the tension of the two strips of paper by returning to step 3.



D.1fc Rotating Singulator Roller

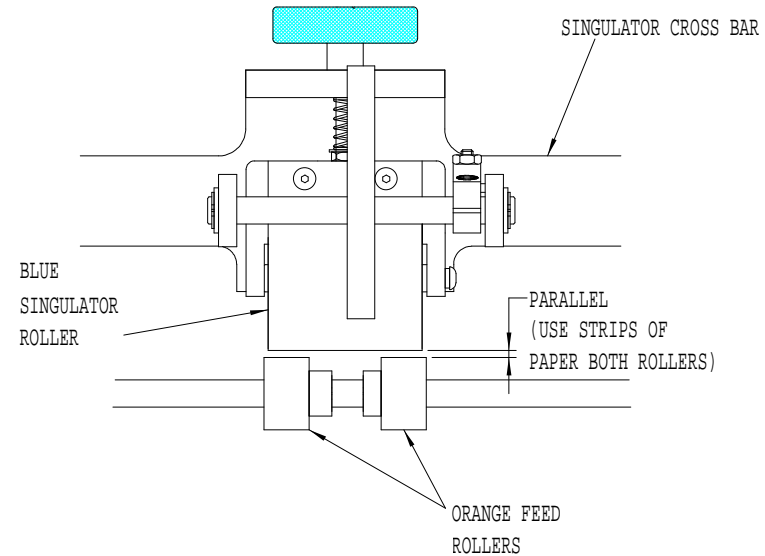
The Singulating Roller is the place where the highest frictional forces are created. These frictional forces wear down the Singulating Roller. This requires that the Singulating Roller be rotated approximately every 500,000 sheets fed, depending on paper type and operator's adjustment of the singulator. **More frequent rotation may be necessary if correct adjustments were not maintained.**

1. Raise Singulating Roller off the auxiliary Singulating Rollers and belt.
2. On left-hand side of the Singulating Roller loosen the setscrew which keeps the Singulating Roller from rotating.
3. Loosen the two screws for the stainless steel brake plate.
4. Rotate the Singulating Roller to expose a new wear surface (rotate about 1/4 inch). The worn surface should be rotated forward. This will prevent the worn surface from coming in contact with paper that is being fed into the singulation point.
5. Secure all three screws.



Singulator Roller Rotation

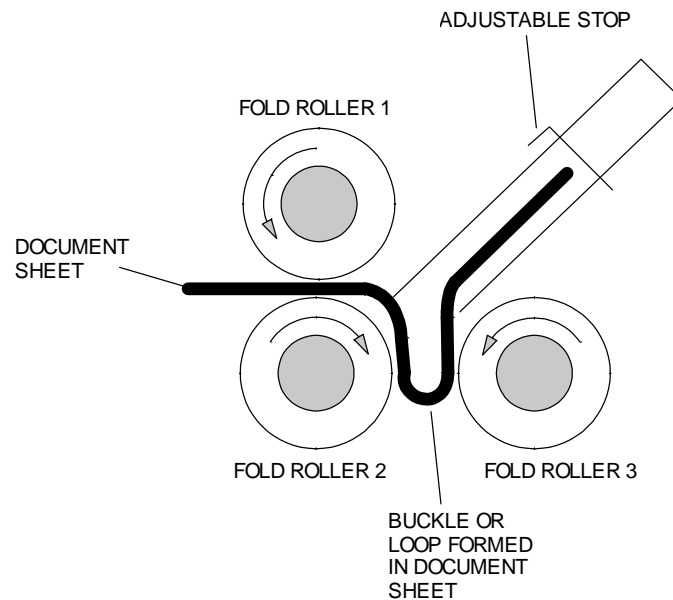
Adjusting Parallelism of Singulator Roller



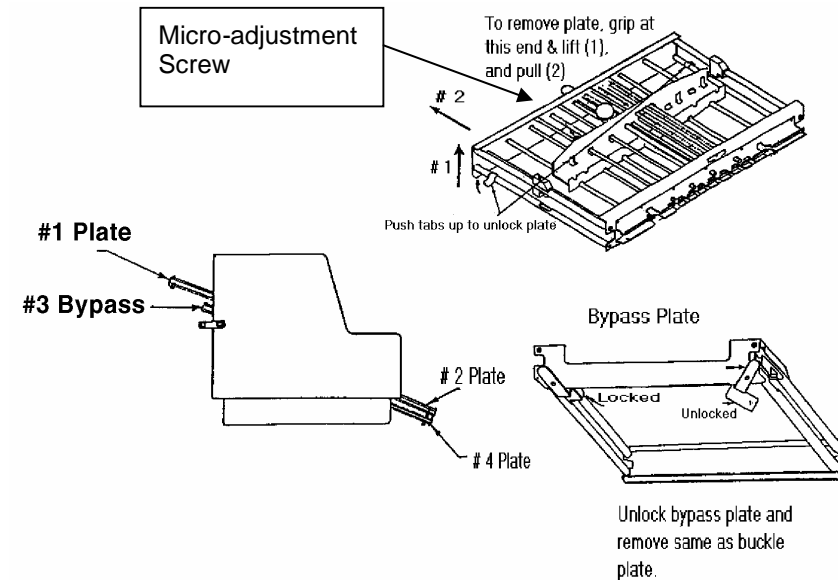
Singulator Roller Parallelism

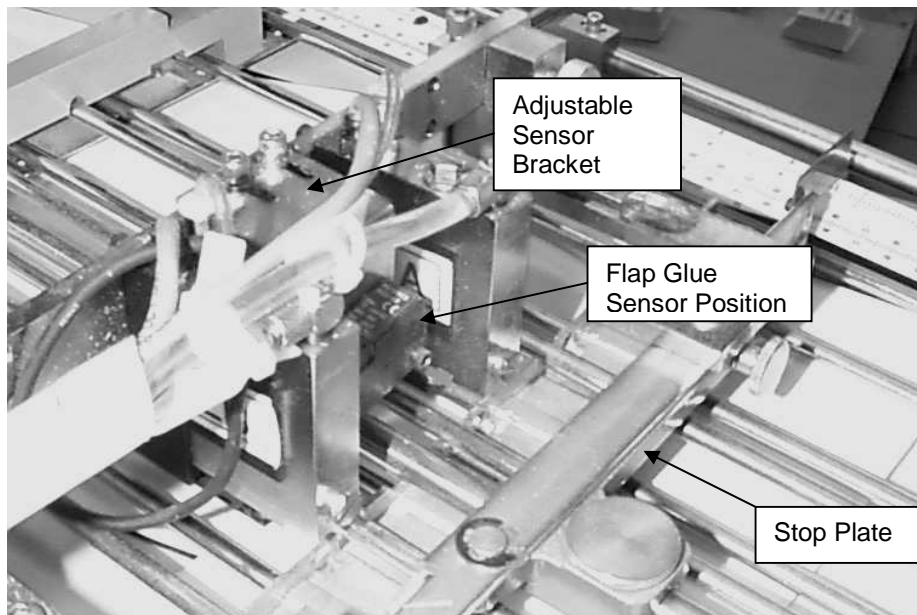
D.2 FOLDER**D.2a Folder Plates****How the folds are made**

1. Fold Rollers 1 and 2 transport the document sheet into the Fold Plate, which has an Adjustable Stop.
2. When the sheet comes up against the stop, a buckle is formed as the rollers continue to turn.
3. As the buckle, or loop, enlarges, Fold Rollers 2 and 3 seize the loop and create the fold.
4. The next set of rollers transport the document sheet into the following Fold Plate or past a Bypass Plate.
5. The process continues through all fold rollers.

**Fold Plate Operation****Adjusting the Fold Plate**

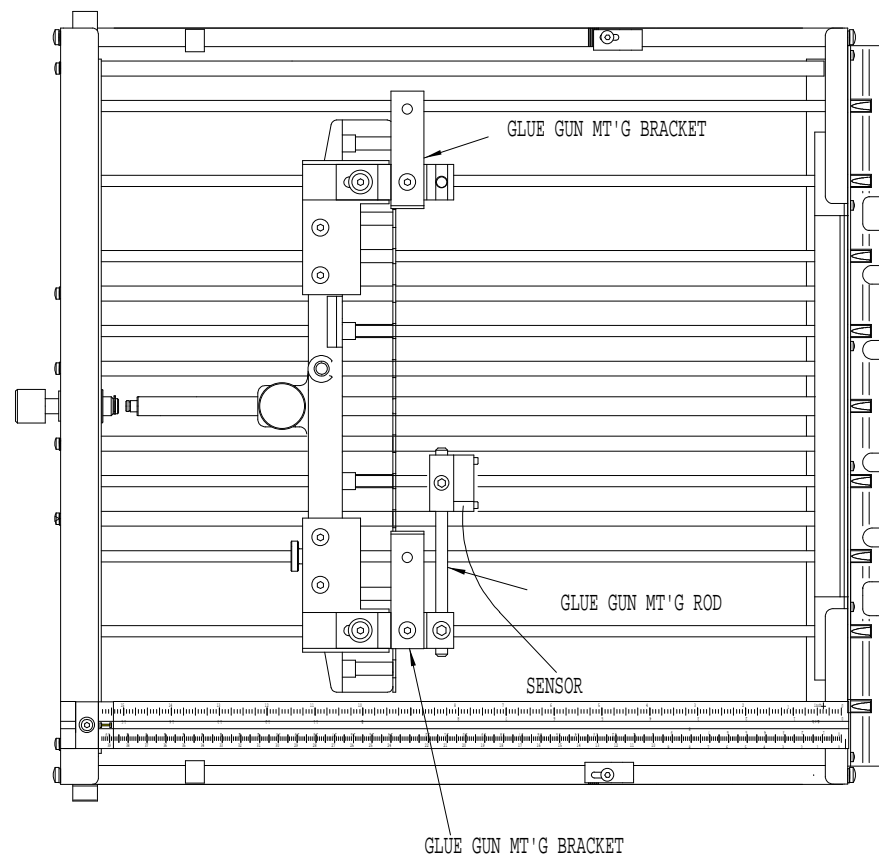
1. Remove the Fold Plate as illustrated below.
2. Place the Fold Plate onto a table or secure flat surface.
3. Loosen the Knurled Knob securing the Adjustable Stop.
4. Set the Adjustable Stop to the desired measurement using the scale.
5. If necessary, adjust with Micro-adjustment Screw. The Micro-adjustment Screw will allow fine adjustment of the Adjustable Stop.

**Setting the Fold Plate Adjustable Stop**



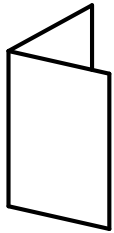
Flap Glue #1 Sensor Adjustment

D.2b Standard Folds

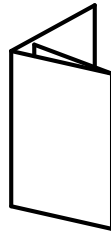
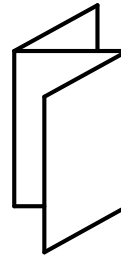


FOLDING STYLES

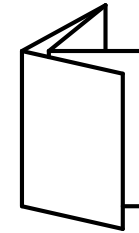
Single Fold



Parallel Letter Fold

Accordian, Z or
Statement Fold

Double Parallel Fold

**Starting Point**

| Type Fold | Sheet Size | Fold Plate | Stop Location | Folder Setups |
|-----------------------------------|------------|------------|---------------|---------------|
| Single Fold | 8 ½"x11" | #1 | 5 ¼" | Standard |
| | 8 ½"x14" | #1 | 6 ¾" | |
| Parallel Letter Fold ("C") | 8 ½"x11" | #1 | 7 ⅛" | Standard |
| | 8 ½"x11" | #2 | 3 ¾" | |
| | 8 ½"x14" | #1 | 9 ⅙" | |
| | 8 ½"x14" | #2 | 4 ⅝" | |
| Accordian or Statement Fold ("Z") | 8 ½"x11" | #1 | 4 ⅙" | Optional |
| | 8 ½"x11" | #2 | 4 ⅓" | |
| Double Parallel Fold | 8 ½"x14" | #1 | 7 ⅛" | Standard |
| | 8 ½"x14" | #1 | 3 ½" | |

Optional Glue Dispensing Buckle Plates are necessary for this fold style

Single Fold
Address down
Leading edge

Single Fold

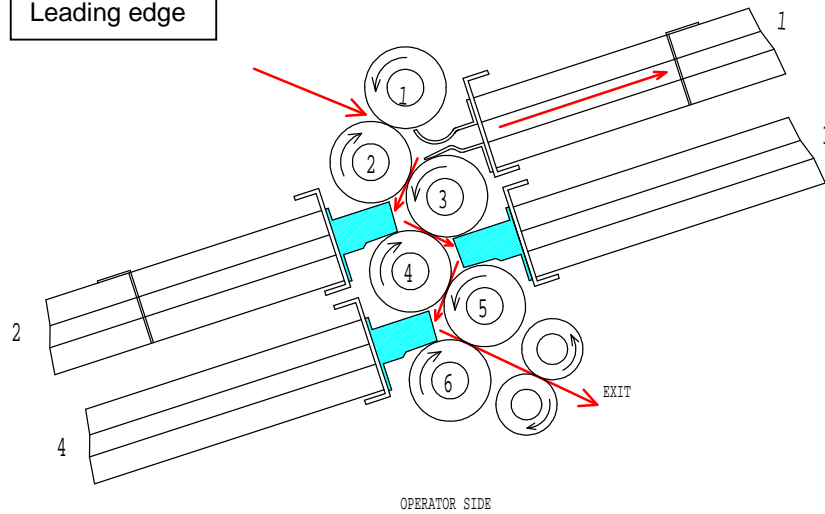
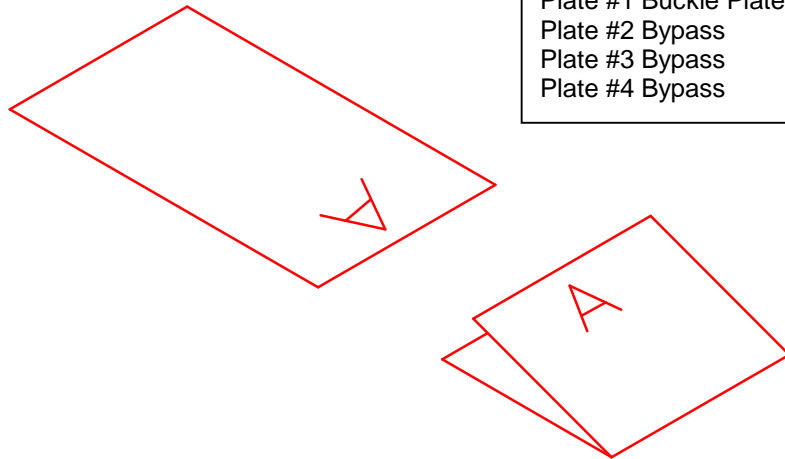


Plate #1 Buckle Plate
Plate #2 Bypass
Plate #3 Bypass
Plate #4 Bypass



Letter Fold
Address down
Leading edge

Letter Fold

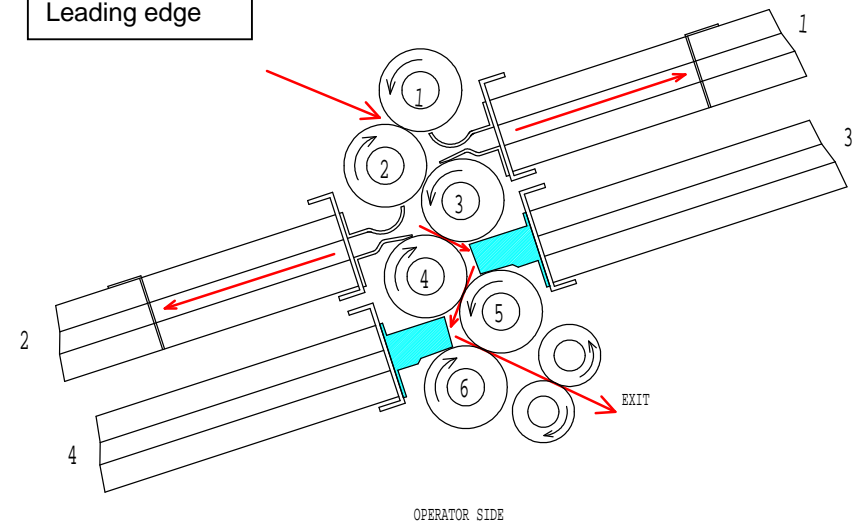
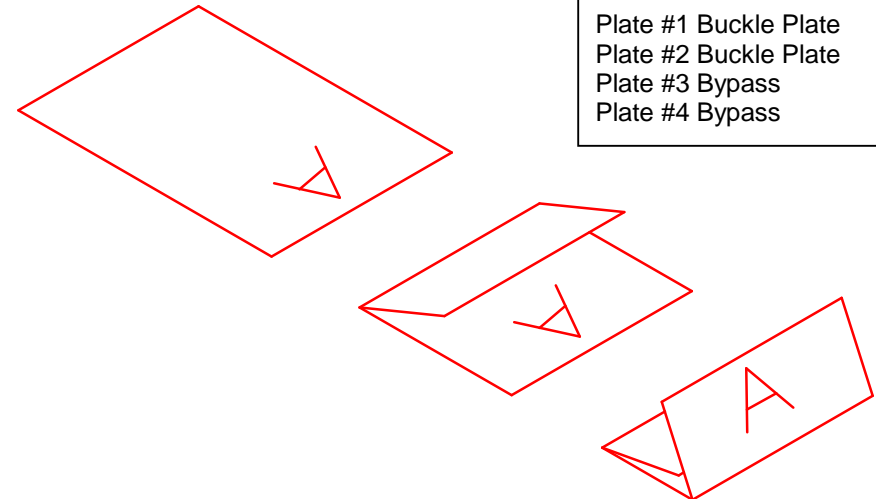
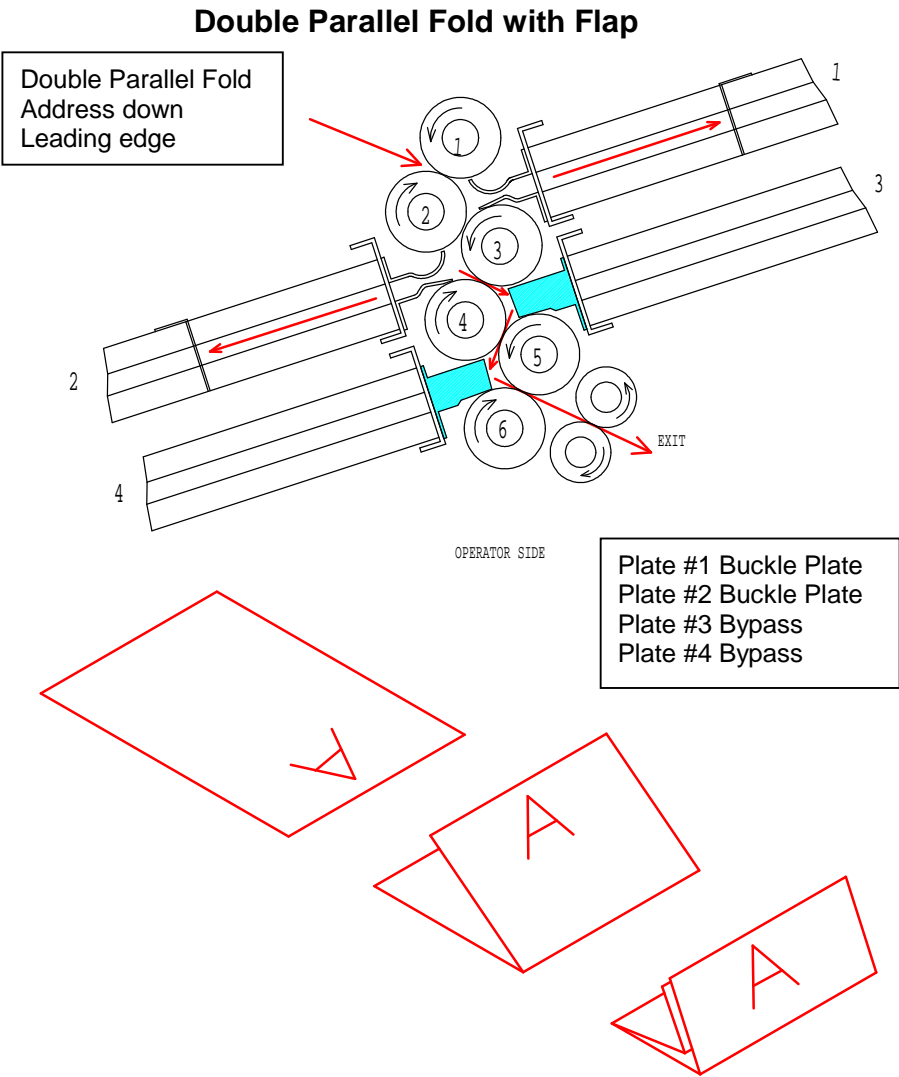
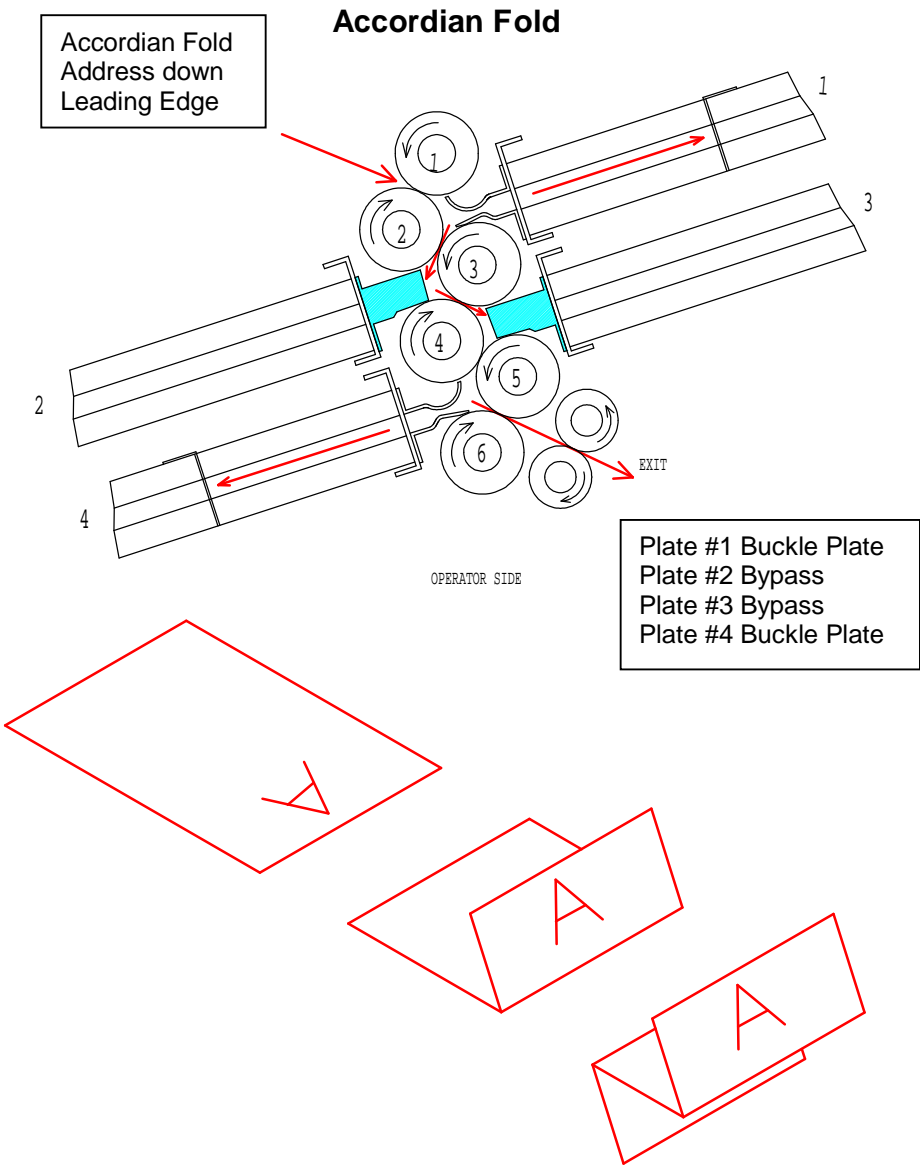


Plate #1 Buckle Plate
Plate #2 Buckle Plate
Plate #3 Bypass
Plate #4 Bypass





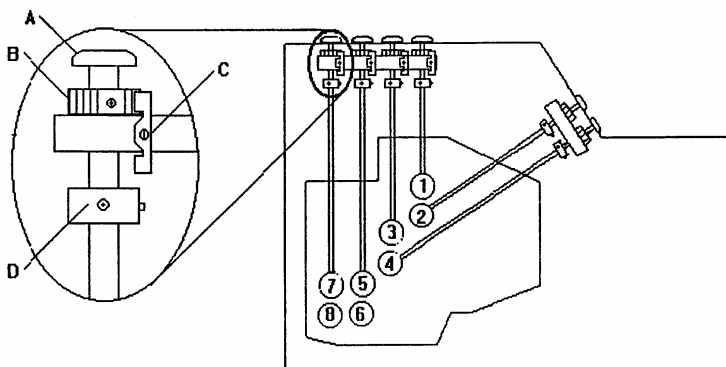
D.2c Folder Roller Tension Adjust

The tension between the folder rollers is adjustable by inserting a 3mm hex wrench into the sockets on the ends of the adjustment rods.

To adjust the rollers it is necessary to start with the rollers that press against the stationary rollers. The stationary rollers are the lower discharge roller (8 on the diagram) and the lower folder roller (6 on the diagram). Turning the adjustment bolt to a higher number on the indicator dial separates the rollers and decreases the tension between them.

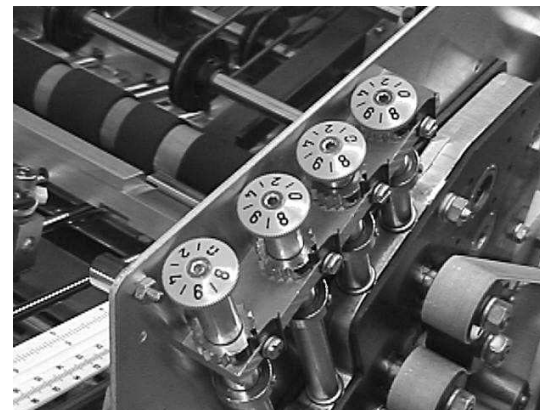
Set all the numbers on both sides to 0 (zero) by turning all the adjustment bolts counterclockwise. This setting provides the maximum amount of tension between the rollers. If it is necessary to make an adjustment to the rollers, be certain that both sides are adjusted to the same number. Uneven folder roller settings will cause jams in the folder.

NOTE: The depth of perforating is also controlled by the pressure on the number 7 and 8 rollers.



Folder Side View

CAUTION: This tension is set at the factory and does not have to be changed. When knives wear out and no longer perforate to proper depth, replace with a new set of knives.



Folder Roller Adjustment

D.2d Perforating Knives

The perforation knives are located on the discharge shafts and consist of a serrated knife on the upper shaft and a straight knife on the lower shaft. To adjust, a 2mm hex wrench is needed. The collar of each knife is split and held together by two 2mm hex head screws.

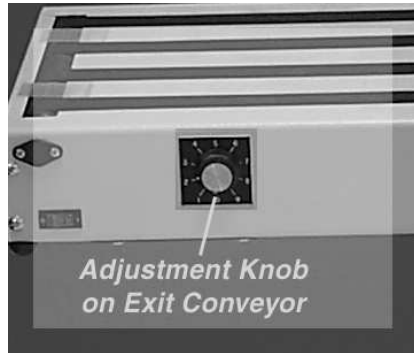
To change the position of the knife:

1. Loosen the screws and slide the knife to the desired position
2. Tighten the screws.
3. Loosen the screws on the other knife and slide it up against the first knife
4. Tighten the screws.
5. Rotate the folder by hand. If it feels rough or makes a grinding noise, the knives are too close together.
6. Position the other pair of knives so that the amount of trimmed off paper is equal on both sides.

Note: To access the folder roller adjustments it is necessary to remove the folder cover

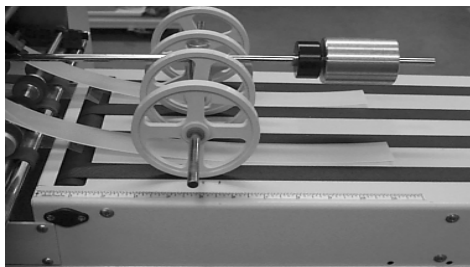
D.2e Exit Conveyor

The Exit Conveyor is located at the output end of the Folder. The merged documents exiting the Folder are shingle stacked on the Exit Conveyor. As each document exits the Folder it passes through the Discharge Sensor. This signals the Exit Conveyor to index. The stacking wheels rest on the Exit Conveyor. The stacking wheels rest on the Exit Conveyor functioning as stop wheels for positioning of the documents. They also apply pressure to glued areas of the folded document.



Exit Conveyor Adjustment

1. Increase speed of the Exit Conveyor by turning the adjustment knob on the side of the Exit Conveyor clockwise to separate the documents.
2. Decrease speed of the Exit Conveyor by turning the adjustment knob counterclockwise to stack the documents closer together.
3. Position the stacking wheels to shingle the finished documents one on top of the other. With 14" paper position center the stacking wheels at 5 1/4" measurement to start.

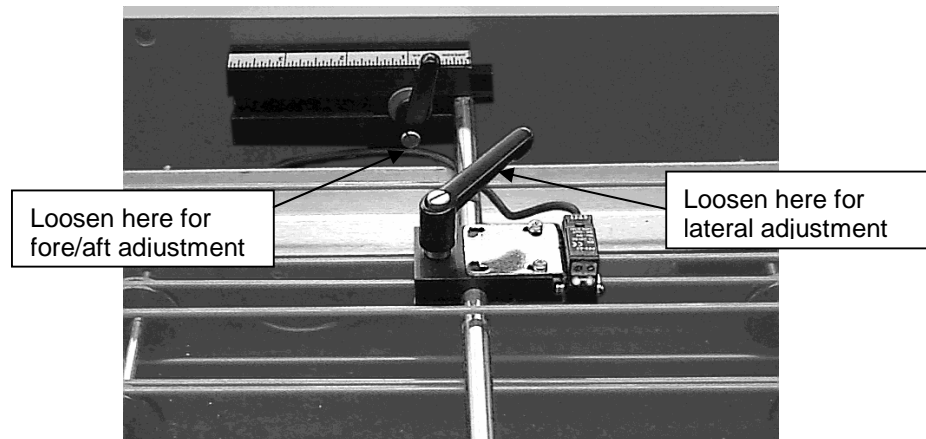


Exit Conveyor

D.2f Side Glue Application Adjustment

The starting point of the side glue is controlled by the location of the side glue sensor. The side glue sensor signals the trailing edge of the sheet of paper. When the sheet's trailing edge passes the sensor, the side glue guns will activate. Moving this sensor forward, towards the folder, will delay the starting point of the side glue. Conversely, moving the sensor backwards (aft), towards the feeder conveyor, will advance the start point of the side glue. Move the sensor laterally by turning the handle to loosen the sensor on the shaft. Position the sensor as required. Fore and aft adjustment is accomplished by positioning the shaft in the channel attached to the inside of the frame.

On initial setup, place a sheet of paper so the leading edge is just covering the nozzle of the side glue guns and adjust the side glue sensor so it is positioned on the trailing edge of the sheet.



Side Glue Sensor

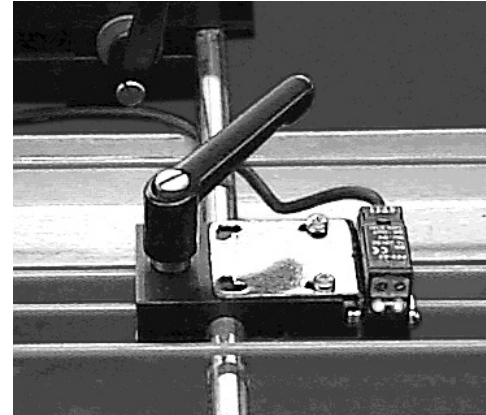
In folding a "C" fold with three equal panels, it is recommended to begin the side glue 0.25 inches from the sheet's leading edge and end the side glue trails at 2/3 the length of the sheet. This will ensure that the entire sides of the documents are glued. Increasing the "DURATION" time on the "SIDE GLUE" setup parameter increases the length of the side glue line. See Section B page 6.

D.2g Flap Glue System Adjustment

D.2h Sensor Adjustment

The paper detecting sensors in the paper feed section and folder buckle plates of the OS-20 are diffuse reflective proximity sensors which are used for triggering the side glue guns and flap glue guns to activate. Each sensor has its own amplifier unit that can be adjusted.

CAUTION: Do not adjust the sensors until making sure that simply cleaning the lens will correct any operating problem. Qualified service personnel should adjust sensors.



Sensor Amplifier

The proper method of adjustment for these sensors is as follows:
All sensors Light-ON mode



ON



OFF

| Order | Operation | Trimmer | Indicators | Adjustment |
|-------|-----------|---------|----------------------|---|
| 1 | | | GREEN RED | 1. With the target removed, turn the trimmer clockwise and find point A at which the red LED indicator light turns off. If the red LED does not turn off even when the trimmer is turned to MAX, take the position of MAX as point A. |
| 2 | | | GREEN RED | 2. With the target in place, turn the trimmer counterclockwise and find point B at which the green LED turns off. |
| 3 | | | GREEN RED | 3. Set the trimmer midway between points A and B. Confirm sensor operation. |

All Sensors – Green is always On and Red is Off. When paper passes under sensor, Red goes On.

SECTION E ALARM MESSAGES

E.1 FEEDER FOLDER MESSAGES

| | |
|-----------------------------|--|
| BATTERY | At boot time the microprocessor memory was found defective. |
| E-STOP/DOOR OPEN | An E-stop caused the machine to stop. |
| FEED | A sheet of paper did not pass the feed sensor in time or did not reach the feed sensor in time or the Creeper Conveyor is not feeding paper to the hopper. |
| DOUBLE DETECT | A double sheet was detected. |
| ILLEGAL FEED SET UP | An illegal parameter was entered in the set up procedure. |
| MAIN FEED JAM | A sheet passed the feed sensor but did not reach the flap glue 1 sensor. |
| DISCHARGE SENSOR JAM | A jam has occurred at the folder discharge sensor. |

E.1 FEEDER FOLDER MESSAGES 1

Error! Bookmark not defined.

NOTES:

SECTION F REPAIR AND REPLACEMENT

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F.1 REPAIR ANALYSIS PROCEDURES

The Repair Analysis Procedures section is used to isolate an identified problem to a faulty component or subassembly. It contains this Introduction and the Repair Analysis Procedures (RAPs).

RAPs will normally isolate a problem to a specific component or subassembly, excluding the wire harness. Wire harnesses are diagnosed using the interconnect drawings and the Block System Diagrams found in Appendix C and the schematics in Section H.

In the Y/N (Yes/No) steps of the RAPs, a Yes response will lead you to the next step. A No response will indicate a corrective action, or will direct you to another step. When the indicated corrective action has been completed, restart the system to verify that the problem has been corrected.

F.1a Initial Actions

Initial Actions are used to gather information from the operator concerning problems in the OS-20.

1. Obtain an accurate description or demonstration of the problem. Request all information on the failure. Some features of the machine may not be tested during the system checks and therefore, operator input will be a valuable asset to help diagnose the total system. If the problem is erratic behavior of the machine, contact your service engineer.
2. If the problem is the result of improper operator action, refer the operator to the operating instructions or instruct the operator on the proper actions.
3. Switch the main power OFF.
4. Check all areas of the machine for paper or other obstructions (including inside the folder). Remove any paper or obstructions. Feed a document (using the red hand wheel) through the machine to confirm that alignment adjustments are correct.
5. Turn ON the OS-20, select "RUN" from main page and turn on conveyors:
 - All drive belts are moving
 - Sensors are not blocked or fouled
 - Machine operating parameters set correctly
 - Document inserted at singulator roller passes through and is properly folded
6. Verify all cable connections are properly mated, and all applicable sensor connections (as per application) are mated properly and not obstructed. In SETUP, verify that correct input peripheral devices are selected.
 - Feeder section: Ensure the input connection is properly made.
 - Stream Feeder: Ensure that the interface cable connection is properly made if that option is installed.
7. Ensure all covers are closed.
8. Verify the Emergency Stop button is not actuated.
9. Proceed to System Checks.
10. Turn ON the Inserter, press RESET/ON, and confirm the following:
 - All drive belts are moving
 - Sensors are not blocked or fouled
 - Machine operating parameters set correctly
 - Document inserted into paper enters at correct location to fold
 - DBL Detect sensor position is adjusted at the factory but may need fine-tuning due to paper type and weight.

NOTE: If physical paper jams recur and mechanical adjustments are correct, contact GBR for further assistance. Potential trouble spots are numerous but include worn or damaged parts; stretched drive belts; excess static.

F.1b Drive Motor RAP

Refer to Section H Schematics.

If the feeder is operating but the Main Drive Motor is not, continue with this RAP.

1. Checks specific to Main Motor failure.
 - a) Ensure that the Overload Protection Switch is not preventing the power from reaching the Motor Control Board. Also check if the switch has failed.
 - b) Check the wiring between all switches affecting the Main Drive Motor and between the motor and Motor Control Board.
 - c) Check the inputs and outputs to the Motor Control Board. If all checks are performed and the controller appears good it may still have failed. Since it is easier to change the controller than the motor, substitute a control board and reconnect the machine. If the control board replacement does not fix the problem go to the next step.
 - d) Replace the Main Drive Motor.
2. When the problem or problems have been solved replace all covers, reconnect the AC power, and place the OS-20 into operation.

F.1c Double Detection RAP

Refer to Section H Schematics.

1. Are mechanical settings correctly made?

Y **N**

- ↓
- Check the wiring and connectors for intermittent connections.
 - Adjust the singulator roller
 - Adjust the auxiliary feed belts
 - Check that the paper guides ensure that the paper passes under the sensor
 - Check that the sensor heads can “see” each other

F.1d Double Sheet RAP

Refer to Section H Schematics.

Analysis: Each time the Feed Clutch energizes, the Double Detect Sensor expects to see one document. If a second document is detected the OS-20 will shut down and display the “DBL DETECT” alarm. Usually this condition is caused by a misadjusted singulator setup, however if the Double Detect Sensor is misadjusted or dirty it is possible for it to think it saw another document and display this error.

Initial Action: Clear any paper that was jammed in the machine and remove any obstructions. Clean the Double Detect Sensor (the second sensor after the singulator) and run the OS-20 again.

1. Are mechanical settings correctly made?

Y

↓

- Check the wiring and connections for intermittent connections.
- Adjust the singulator roller.
- Adjust the auxiliary feed belts.
- Adjust the Demand Switch plate.
- Adjust the Creeping Conveyor.
- Check that the paper guides ensure that the paper passes under the sensor.
- Check that the paper feed is set up to run the length of stock that is being used.

N

F.1e Paper Could Not Be Fed RAP

Refer to Section H Schematics.

Initial Action: clear the paper that was jammed in the machine and remove any obstructions.

1. Are mechanical settings correctly made?

Y N

↓ Check the wiring and connections for intermittent connections.

- Adjust the singulator roller.
- Adjust the auxiliary feed belts.
- Adjust the Demand Switch plate.
- Adjust the Creeping Conveyor.
- Check that the paper guides ensure that the paper passes under the sensor.
- Ensure that the drive pulleys are tight.
- Check the feed clutch.

2. Clean the sensors. Do the sensor keys light up on diagnostic display screen?

Y N

↓ • Replace the sensor.

3. See section B page 16

Y N

↓ • Check the wiring to PLC (CPU).
• Check the amplifier

F.1f Paper Jam in Feeder RAP

Refer to Section H Schematics.

Initial Action: clear the paper that was jammed in the machine and remove any obstructions.

1. Are mechanical settings correctly made?

Y N

↓ Check the wiring and connections for intermittent connections.

- Adjust the singulator roller.
- Adjust the auxiliary feed belts.
- Adjust the Demand Switch plate.
- Adjust the Creeping Conveyor.
- Check that the paper guides ensure that the paper passes under the sensor.
- Ensure that the drive pulleys are tight.
- Check the feed clutch.

- Check that the paper feed is set up to run the length of stock that is being used.

2. Are the lights on the Feed Sensor illuminated?

Y N

↓ • Go to step 4.

3. Place a sheet of the current stock in the sensor area and adjust the sensor so that the red LED goes on with a sheet blocking the sensor. Check that printing on the stock is not interfering with the sensor. Does the red LED on amplifier light when a sheet is under the sensor?

Y N

↓ • Check the wiring to PLC
• Check the amplifier

4. Select page 6 "DIAGNOSTICS". Block sensor with paper. Does selected sensor button light up on the display screen?

Y N

↓ • Check wiring connection of the sensor

5. Is there 24 VDC at connectors?

Y N

↓ • Check the connection from the PLC to the Feeder
• Check the wiring
• Check the power supply

6. Clean the sensors. Do the LEDs come on?

Y N

↓ • Replace the sensor.

F.1g Paper Jam in Folder Infeed

Initial Action: clear the paper that was jammed in the folder and remove any obstructions.

1. Check paper guide rail alignment to folder rollers, for minimum clearance;
if more than minimum clearance exists (refer to figure: 1-1).
 - Loosen set screws (2x) in chassis and justify downwards.
 - Secure the screws.
3. Recheck for minimum clearance, if more than minimum clearance still exists.
 - Loosen set screws (2X) and thumbscrew.
 - Check to make sure rail guide block is parallel with paper guide rail.
 - Check for minimum clearance.
 - Retighten set screws and thumbscrew.

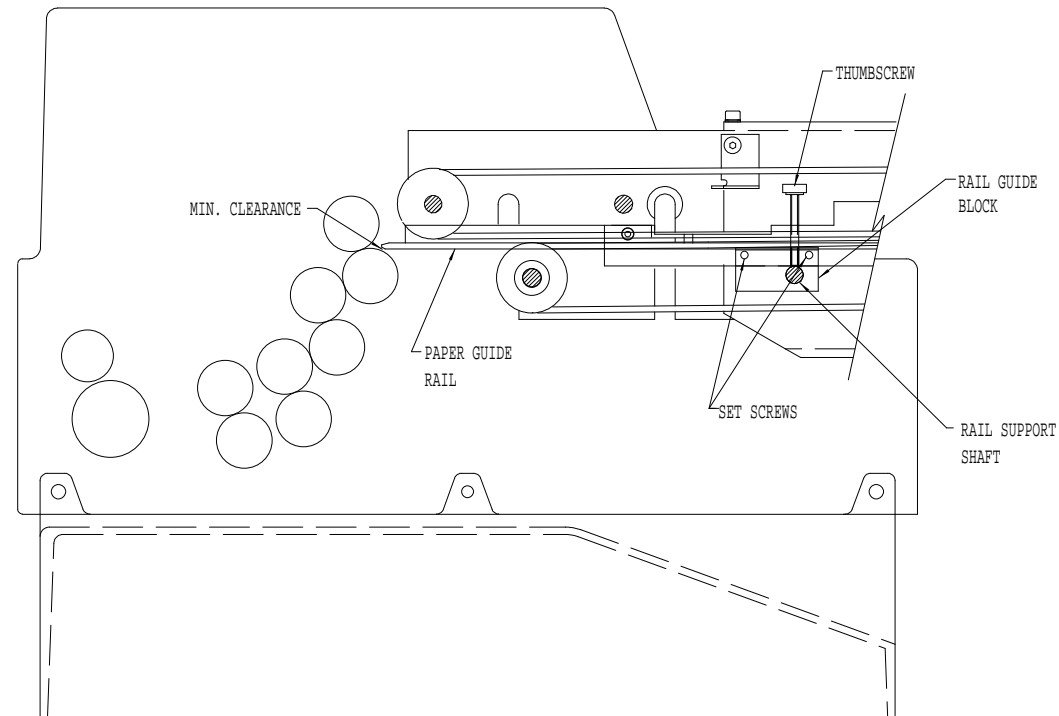


FIGURE 1-1

F.1h Small Sheet RAP

Initial Action: Clear the paper that was jammed in the machine and remove any obstructions.

1. Does the paper move through the feeder properly?

Y N

- ↓
- Check that the guide rails ensure the paper passes under the Feed and Double Detect sensors.
 - Ensure that the pullout roller does not force the paper to ride up on the paper guides.
 - Check that the paper stock being used is not damaged or curled.
 - Adjust the singulator roller.
 - Adjust the auxiliary feed belts.

F.1i Feeder Speed is too slow RAP

Initial Action: Refer to Section H Schematics.

Remove the covers from the feeder

1. Does the feed motor turn on?

Y N

- ↓
- Go to step 3.

2. Is there voltage at the connector that feeds the motor when the conveyor is on?

Y N

- ↓
- Check fuses.
 - Check KBIC Controller board. Replace is necessary.
 - Replace the Feeder Drive Motor.

F.1j Creeper Conveyor Motor RAP

Refer to Section H Schematics.

1. When the OS-20 is powered up and the 450 Feeder is selected, power is supplied to the Feeder via the AC outlet of the OS-20. The Creeper Motor goes on?

Y N

- ↓
- Make sure that setup is configured for 450 Feeder ("H.C. Feeder")
 - Check wiring between OS-20 Inserter and Feeder.
 - Check fuses.

2. Select Diagnostics. Select Display status of inputs 15 - 8. Activate the demand switch: does LED on opto module 0 light?

Y N

- ↓
- Check the demand switch.
 - Check the optical relay.
 - Check optical relay fuse.
 - Replace the opto module.

3. The creeper motor runs when there is demand for paper.

Y N

- ↓
- Check fuses
 - Check relay
 - Make sure the speed pot is correctly set.
 - Check for 120VAC across L1 and L2 of the motor control board.
 - Check for 90VDC across A- and A+ of the motor control board.
 - Replace the KBIC board.
 - Replace the creeper motor.

4. Paper is fed through the Feeder as the Feed Clutch fires.

Y N

- ↓
- Replace the Feed Clutch.

F.1k Incorrect Folds RAP

1. Settings of fold plates are correct.

Y **N**

↓ • Adjust fold plates as described in section D.

2. The document folds are crooked (skewed).

Y **N**

↓ • Go to step 4.

3. Adjust the skew stop to account for paper trim or shape.

4. Check that the fold plates and deflector plates are positioned correctly and locked.

Y **N**

↓ • Seat the plates and engage the locking lever.

5. Assure the integrity of the document paper supply and determine if operating conditions are contributing to the problem (temperature, humidity and paper storage conditions can affect paper handling capabilities of the OS-20).

**WARNING**

Isopropyl rubbing alcohol is **FLAMMABLE!** Unplug the machine before cleaning the rollers. **DO NOT** use near an open flame, sparks or any other source of ignition. **DO NOT** smoke in the vicinity of the alcohol fumes. Air dry the cleaning rag. Dispose of used rags properly. Only purchase consumer packaged rubbing alcohol. Only keep small quantities of Alcohol on the job site (16 oz., 500 ml or less). Store alcohol properly.

a)

FIGURE 1-1

F.2 PM PROCEDURE

PM's are done to replace any worn parts on this machine. This prevents any feed problems, transportation problems or folding problems. PM's are to be done on a regular and/or scheduled time period depending upon customer contract.

Parts Replaced on a PM

Note: Always make notes of the way parts are removed from the machine to make it easier to replace the new ones. Have the correct print on hand for the area of the machine you are working on.

F.2a Feeder: Feed Belt

There are five (5) shafts that have to be removed in order to change this part. See Section G, Feeder Assembly

- First (left to right) is Tensioner Shaft. There are two (2) set screws that have to be loosened on each side. A plastic Worm Gear comes through the frame and into the end of this shaft that has to be removed and a socket head screw on the opposite side of this machine that has to be removed as well.
- Rail Support Shaft which is held on by one (1) socket head screw on each side is also held by two (2) set screws on each block that hold it to the Paper Guide Rails.
- The second Tensioner Shaft also has two (2) set screws on each side that have to be loosened and a plastic gear (same as described in first section) that has to be removed with a socket head screw on the opposite side.
- The next shaft is the Singulator Drive shaft where your two (2) small orange rollers and auxiliary feed belts (red) are found. Loosen the lock collars on both sides and the lock collar on the black bearing block in the center of this section. Remove the Timing Belt and pulley on the outside of the chassis. Loosen the setscrews on the drive rollers and on the auxiliary pulley, then you should be able to slide shaft outward through the bearings (**Note:** do not remove or loosen bearings if not necessary). Loosen set screws on drive rollers and feed belt, slide drive roller and auxiliary asm off this shaft to remove previous shaft out of the way, in order to change feed belt.
- Last is the Hopper Feed Shaft. Must loosen all three (3) lock collars on the shaft and also remove pulley on both sides (outer side of chassis). Loosen the Feed Drive Pulley to slide shaft outward. At this point you should be able to remove your feed belt very easily and replace with a new belt.

Replace all shafts, pulleys and timing belts in proper place. Make sure every screw is tightened properly and always double check before powering up machine.

F.2b Drive Rollers

See Section G - Feeder Assembly

To replace drive rollers:

- Loosen the three (3) lock collars on the shaft.
- Loosen the setscrew in auxiliary pulley.
- Remove the pulley on the left (outside of chassis) along with timing belt.
- Loosen setscrew on both rollers and slide shaft outward to point your slide rollers out. Replace with new roller slide shaft back into place and tighten lock collars.
- Put pulley and timing belt back in place.

F.2c Auxiliary Belts

See Section G - Outside Feed Belt Assembly

If auxiliary belts are worn, there is a simple way of replacing them:

- First, cut off the old belt.
- Pull off pulley that is located on the back part of the auxiliary asm by removing the screw, then cut new belt to correct length. *Note:* Do one at a time.
- Slide the cut belt through the two shafts and with a belt welder; weld the two (2) ends together. (Make sure you get a good weld). Let it cool for a few minutes then cut off the extra rubber around the weld until you get it smooth, use a file of dremel tool with sand paper if necessary.

F.2d Singulator Roller

See Section G - Singulator Assembly

- Loosen the setscrew located on the left side that holds the singulator from moving.
- Remove the plate on the singulator; remove the clip on the bar where demand wand is located.
- Then remove the far side bracket.
- Slide the bar off of the other bracket and pull it out of your way.
- On the other side of the singulator roller, there is a setscrew that holds the bar that the roller rides on. Remove the bar and the singulator should slide out.
- Replace with a new roller the same way you took it out.

F.2e Pullout Roller

See Section G - Feeder Assembly

There are two shafts you have to work with in order to replace pullout roller and upper/lower shafts.

- Loosen the lock collars on both sides of upper Transfer Shaft. (One (1) of the lock collars could be on the outside of the chassis).
- Loosen all the Drive Pulleys that the 1/8" red belting rides on and the rollers themselves. Slide the shaft outward through the left side (because the two (2) shafts have plastic pressed on gear that does not come off), and remove your upper roller. (*Note:* You also have to remove one of the pulleys on the shaft in order to remove the roller).
- Before you replace the roller on the upper shaft, go to your bottom shaft and loosen all lock collars (there are three (3) lock collars on bottom shaft).
- Remove on outer side of chassis, the Encoder and Clutch. Be very careful not to loosen the spacer for the encoder to make note how you took it off. (Make sure your replace them properly).
- On the outer left side of chassis, remove pulley and timing belt. Make sure you loosen the pulley on the Drive Shaft and also the roller. Slide the shaft outward from left side and remove roller. At this point, you can replace both rollers. Make sure the pulleys are back on the shafts and make sure all 1/8" red belting are also on the shaft before putting shafts in proper place.

F.2f 1/8" Red Belting

See Section G - Feeder Assembly

To replace 1/8" red belting, you have to cut them off.

- Measure the proper length (1/4" shorter than the original belt) of a new belt through the shafts to its proper position.
- Take each end and weld them together with a belt welder. Hold in place until you get a proper weld, then snip off the melted rubber around the weld. Get it smooth all around. Use a file if necessary.
- The three (3) top belts are the same length and the three (3) bottom belts are the same length.

F.2g Folder - Transport Rollers

See Section G - Folder Assembly

There are two (2) Shafts.

- Remove the folder cover on the right side; loosen the setscrew on the rollers.
- Loosen the lock collars to the right of the shaft and you'll see a slit in the shaft. With a screwdriver, separate the shaft at this point. Then slide the rollers out and replace with new rollers.
- Slide the shaft back together and set the rollers in a proper position.

F.2h Folder Flat Belts

See Section G - Folder Assembly

- Loosen pulley on the transport unit and slide the timing belt and pulley to the side, separate the bottom output shaft to remove the timing belt off the shaft.
- At this point, you should be able to remove the transport unit from the folder.
- Remove one side of the transport unit, by removing two (2) screws, take the side plate off, at this point you should be able to remove the grey belt and replace with new ones. (*Replace unit and belts in reverse order).

F.2i Folder Perf Knives

See Section G - Folder Assembly

All perf knives come in two (2) pieces, they are held on the shaft by two (2) screws, same with the perf cylinder. (**Note:** Perf knives ride in the center of this cylinder).

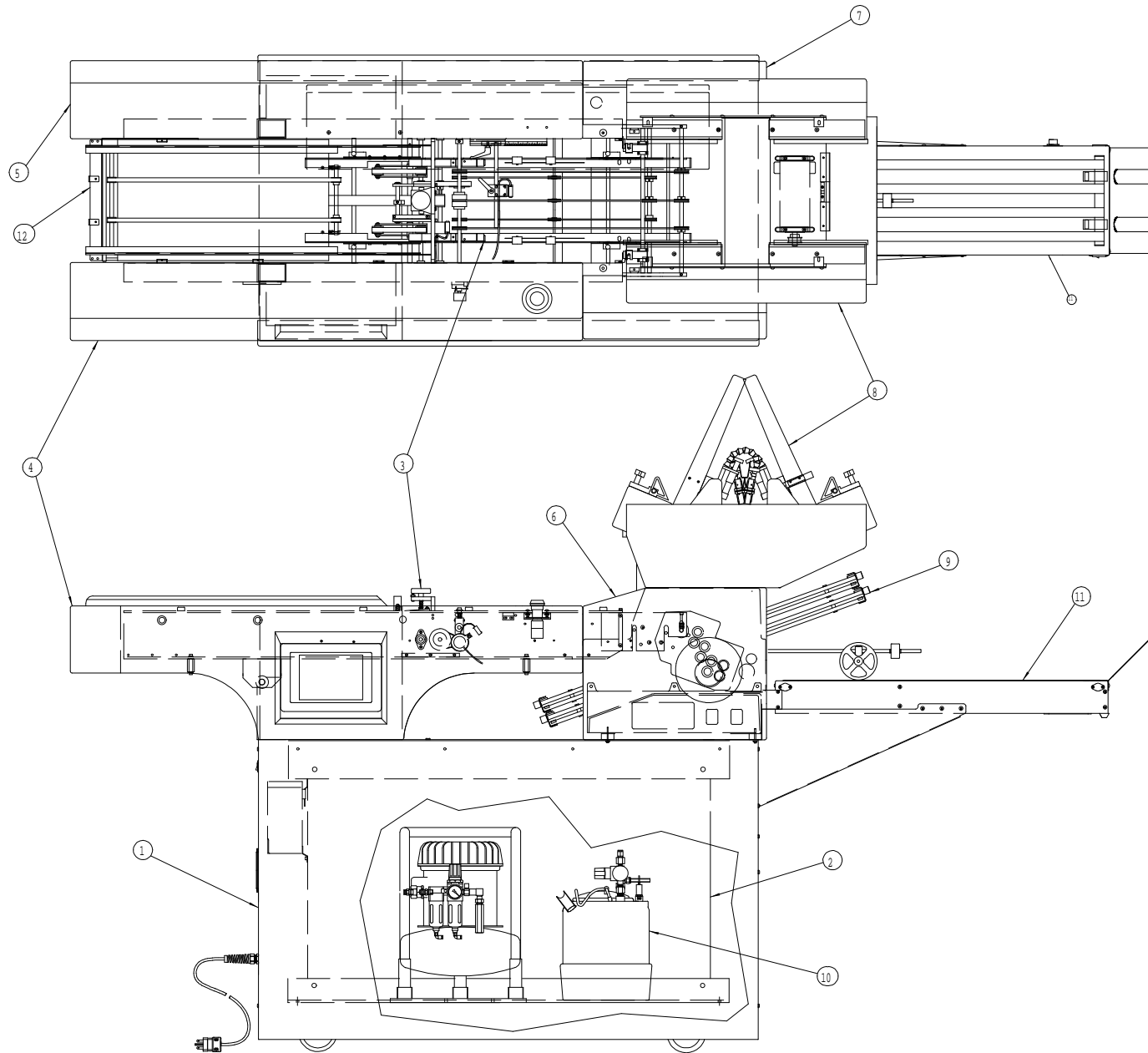
To replace perf knives:

- Loosen the two (2) screws all the way until the knives separate (same with perf knife). **Note:** Perf knives sometimes after loosening knives will not separate easily, tap lightly with butt end of a screwdriver to separate.

NOTES:

SECTION G PARTS

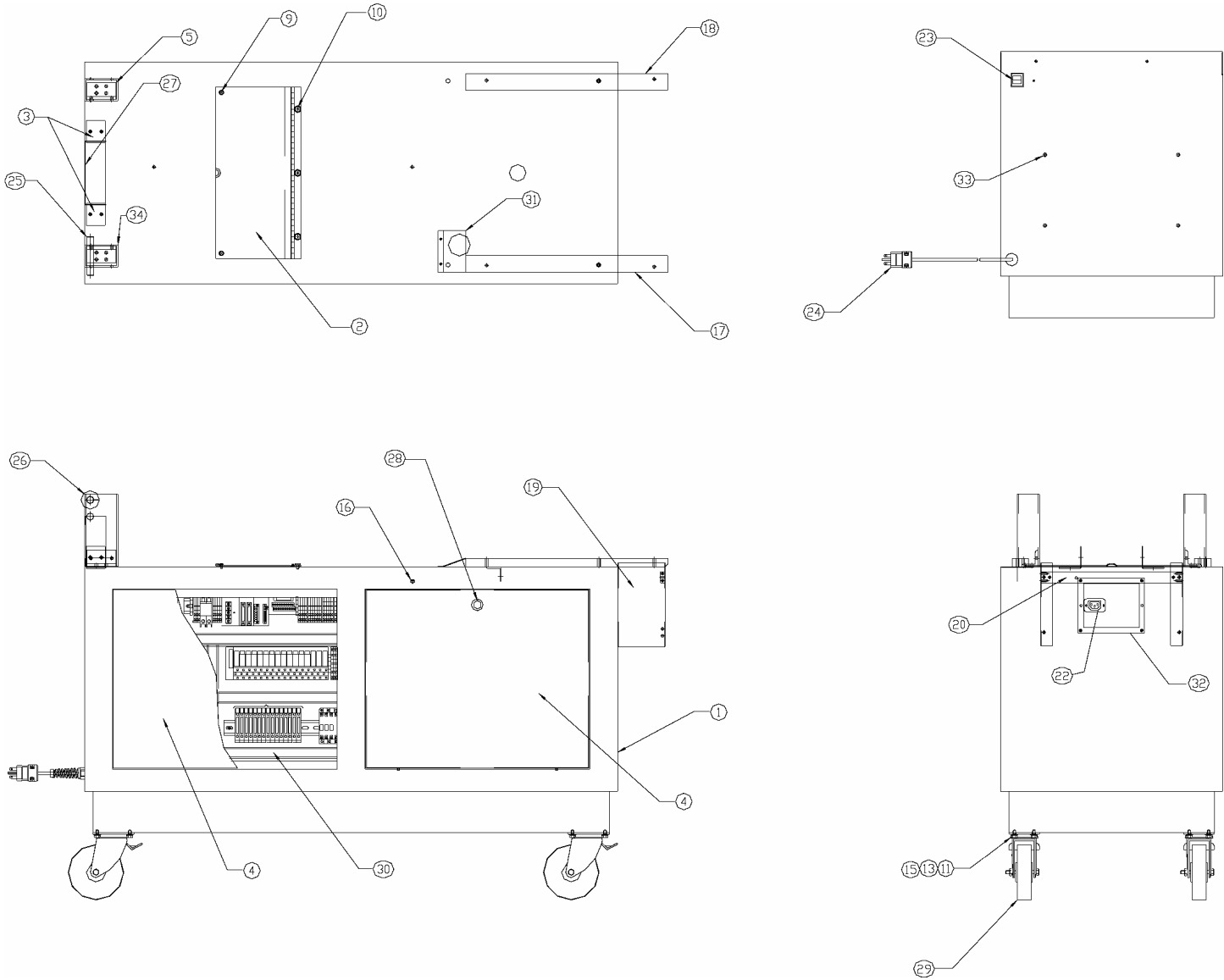
| | |
|--|------------------------------|
| 700-30117-500, OS-20 TOP ASSEMBLY | 2 |
| 005-30121-500, CABINET ASSEMBLY | 4 |
| 502-27486-500, ELECTRONICS ASSEMBLY | 6 |
| 549-30123-500, FEEDER ASSEMBLY, page 1 | 9 |
| 549-30123-500, FEEDER ASSEMBLY, page 2 | Error! Bookmark not defined. |
| 549-30123-500, FEEDER ASSEMBLY, page 3 | Error! Bookmark not defined. |
| 549-30421-500, SINGULATOR ASSEMBLY | 12 |
| 002B-21905, AUXILIARY FEED BELTS | 14 |
| 750-28557-500, CREEPER CONVEYOR | 16 |
| 002B-16631, FRONT SHAFT ASSEMBLY | 18 |
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| 703-27277-500, FOLDER, 4 PLATE, page 2 | 22 |
| 703-27277-500, FOLDER, 4 PLATE, page 3 | 24 |
| 703-27277-500, FOLDER, 4 PLATE, page 4 | Error! Bookmark not defined. |
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| 563-27998-500, FOLD PLATE 1, Z FOLD OPTION | 34 |
| 186-034007856, PAPER STOP, FOLD PLATE | 36 |
| 186-034004811, FOLD PLATE 2 | 37 |
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| 186-034004813, FOLD PLATE 4 | 39 |
| 563-27999-500, FOLD PLATE 4, Z FOLD OPTION | 40 |
| 186-034004814, BYPASS PLATE 1 & 3 | 42 |
| 186-034004815, BYPASS PLATE 2 & 4 | 43 |
| 186-034007855, BYPASS PLATE 2 & 4, Z FOLD | 44 |
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| 750-27251-000, EXIT CONVEYOR, page 2 | 47 |

700-27363-500, OS-20 TOP ASSEMBLY

700-27363-500, OS-20 TOP ASSEMBLY

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|----------------------|
| 1 | 005-27276-500 | CABINET ASSEMBLY |
| 2 | 502-27486-500 | ELECTRONICS ASSEMBLY |
| 3 | 549-27234-500 | FEEDER ASSEMBLY |
| 4 | 579-27321-500 | RIGHT FEEDER COVER |
| 5 | 579-27322-600 | LEFT FEEDER COVER |
| 6 | 579-27643-500 | RIGHT FOLDER COVER |
| 7 | 579-27645-500 | LEFT FOLDER COVER |
| 9 | 703-27277-500 | FOLDER,4 PLATE |
| 10 | 750-27291-500 | EXIT CONVEYOR |
| 11 | 750-27401-500 | CREEPER CONVEYOR |

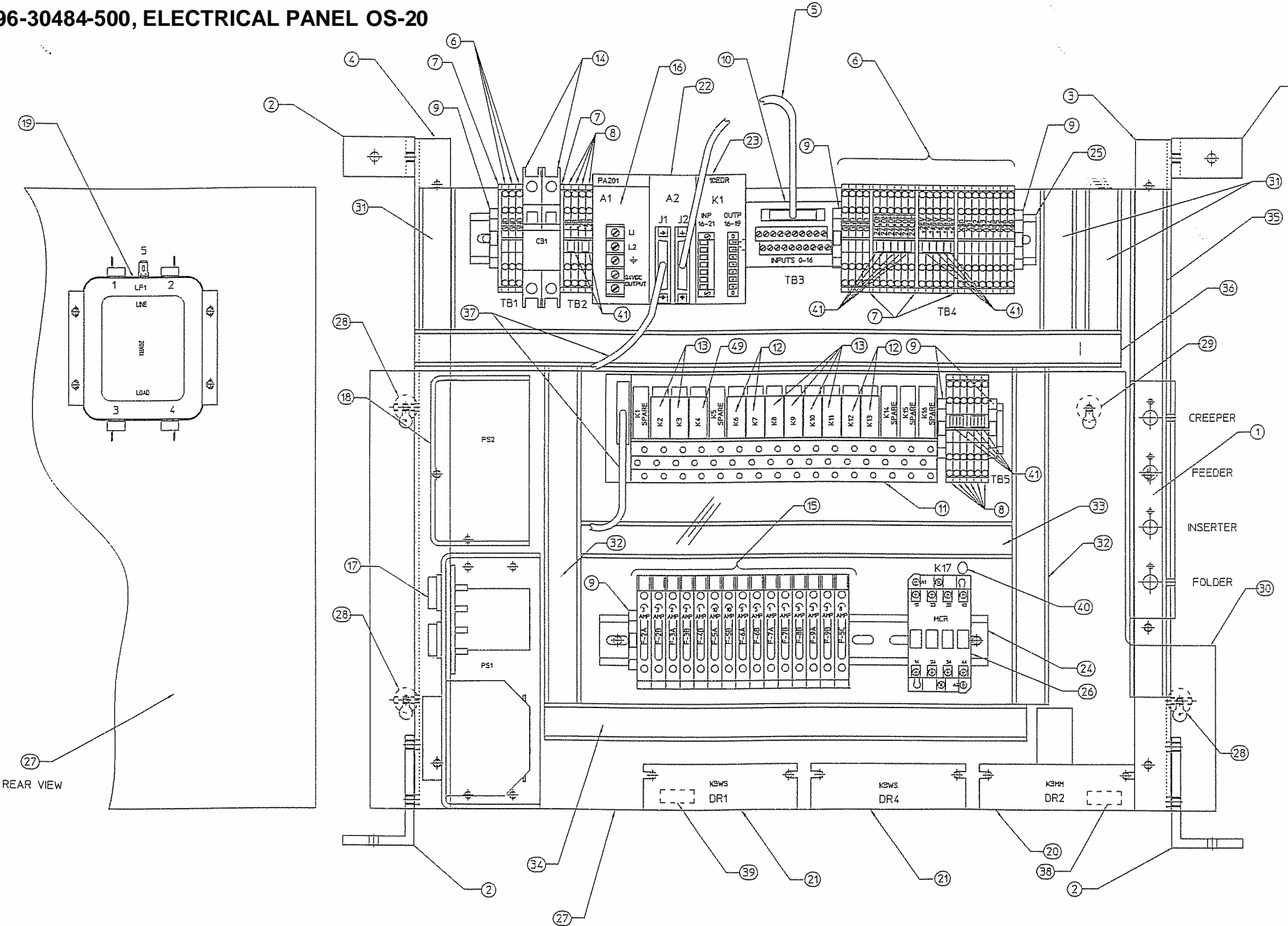
005-30121-500, CABINET ASSEMBLY



005-30121-500, CABINET ASSEMBLY

| | 34 | TOWER | 600B-23498 | 2 |
|------|------|--------------------------------------|---------------|------|
| | 33 | GROUND SCREW | 600A-17921 | 1 |
| | 32 | I-O PLATE | 584-25590-600 | 1 |
| | 31 | COVER, CONTROL CABLE | 579-30549-600 | 1 |
| | 30 | PANEL, CONTROLER PLC ONE STEP MAILER | 196-30484-500 | 1 |
| | 29 | CASTER WITH BRAKE | 175-05050XZK | 4 |
| | 28 | LOCK | 172-CR7300 | 4 |
| | 27 | GUIDE, WIRE | 144-30592-600 | 1 |
| | 26 | COLLAR, SPLIT CLAMP | 124-15918 | 4 |
| | 25 | PIVOT ROD | 095-27193-600 | 2 |
| | 24 | CABLE, AC POWER ASSEMBLY (M-40) | 046-27759-500 | 1 |
| | 23 | SWITCH, ROCKER | 041-25066 | 1 |
| | 22 | OUTLET-POWER, IEC 320 | 035-83011220 | 1 |
| | 21 | ADAPTOR, M-F-M | 025-A42 | 1 |
| | 20 | SUPPORT, TIE BAR CONVEYOR | 020-30534-600 | 1 |
| | 19 | SUPPORT, CONVEYOR, STRAIGHT | 020-30516-600 | 2 |
| | 18 | SUPPORT, FOLDER MOUNT, RIGHT | 020-30125-600 | 1 |
| | 17 | SUPPORT, FOLDER MOUNT, LEFT | 020-30124-600 | 1 |
| | 16 | WASHER EXT LOCK | 016-308 | 5 |
| | 15 | 1\4 SPLIT LOCKWASHER | 016-125 | 16 |
| | 14 | #8 SPLIT LOCKWASHER | 016-108 | 2 |
| | 13 | 1\4 FLAT WASHER | 016-025 | 16 |
| | 12 | #8 FLAT WASHER | 016-008 | 2 |
| | 11 | 1\4-20 x 1\2 HEX BOLT | 014-25062208 | 16 |
| | 10 | PHMS, 1\4-20 x 3\8 | 014-25000006 | 3 |
| | 9 | PHMS, 8-32 x 3\8 | 014-08200006 | 2 |
| | | | | |
| | 7 | | | |
| | 6 | | | |
| | 5 | BRACKET, TOWER SUPPORT | 007-27224-600 | 2 |
| | 4 | PANEL DOOR | 005-25963-600 | 4 |
| | 3 | BRACKET, TOWER | 005-25959-600 | 1 |
| | 2 | COVER | 005-25957-600 | 1 |
| | 1 | CABINET | 005-25956-600 | 1 |
| REV. | ITEM | DESCRIPTION | PART NUMBER | QTY. |

196-30484-500, ELECTRICAL PANEL OS-20

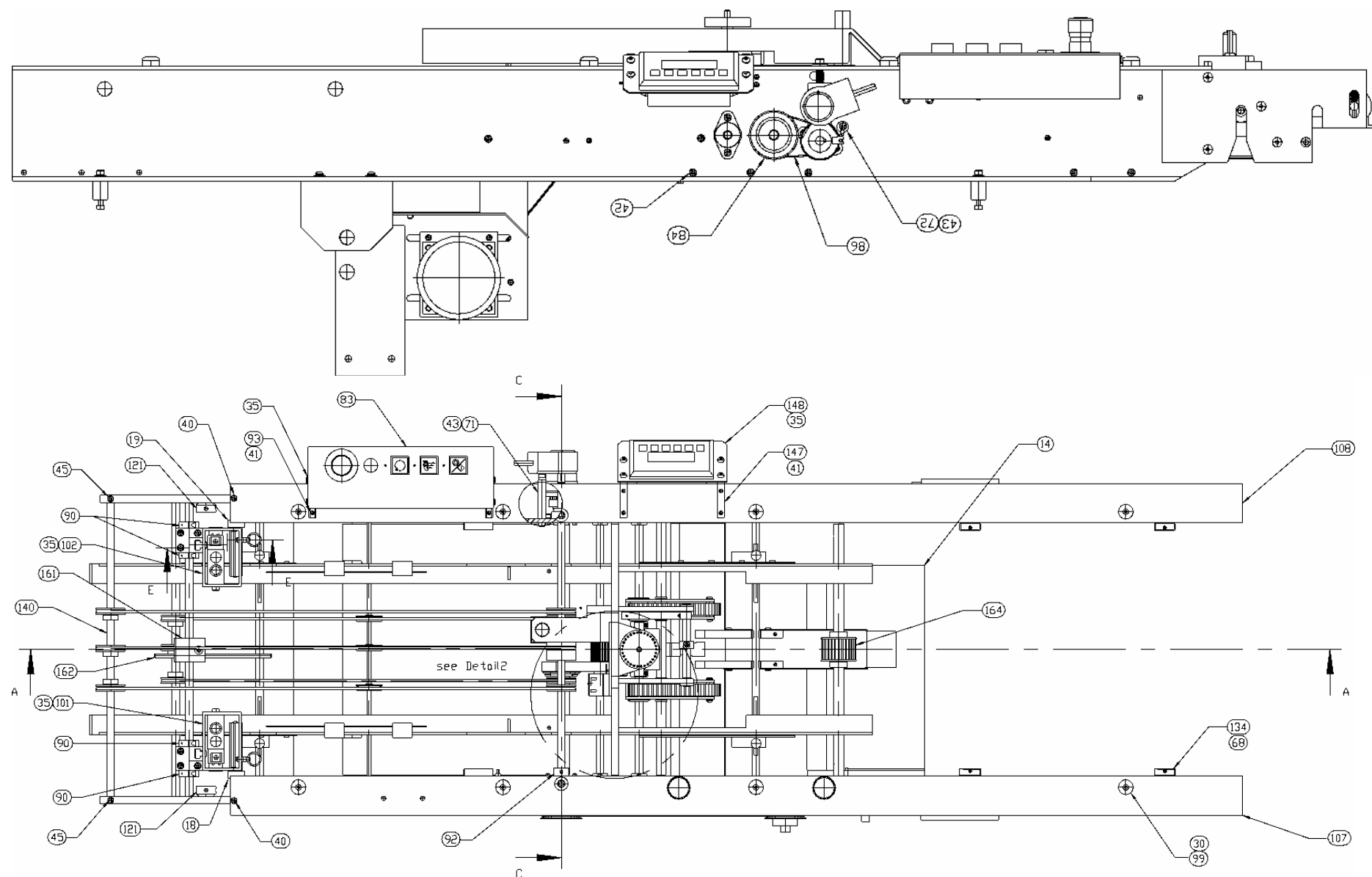


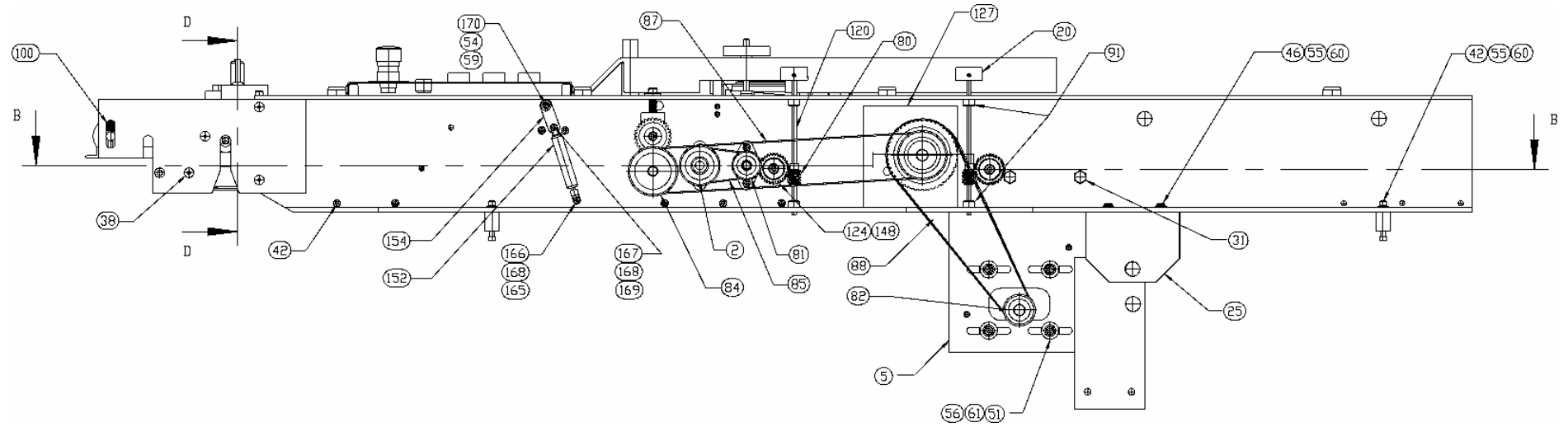
196-30484-500, ELECTRICAL PANEL OS-20

| COMPONENT | PART NUMBER | DESCRIPTION |
|--------------------------------|----------------|--|
| 1 | 007-30514-600 | BRACKET, SPEED POT MOUNT |
| 2 | 007-30515-600 | BRACKET, CONTROL PANEL MOUNT |
| 3 | 020-30546-600 | SUPPORT, PLC PANEL RIGHT |
| 4 | 020-30547-600 | SUPPORT, PLC PANEL LEFT |
| 5 | 046-30490-000 | CABLE, PLC EXPANSION OUTPUT |
| 6 | 024-29662-000 | 4 CONDUCTOR TERMINAL BLOCK |
| 7 TB4, TB2, TB1 | 024-29663-000 | END PLATE |
| 8 TB2 | 024-29665-000 | 4 CONDUCTOR THROUGH TERMINAL BLOCK |
| 9 TB4 | 024-29666-000 | END STOP, SCREWLESS |
| 10 | 024-30489-000 | TERMINAL BLOCK, 16 INPUT |
| 11 | 030-30491-000 | RELAY, 16 CHANNEL RELAY BASE |
| 12 K12, K13, K6, K7 | 030-30493-000 | RELAY, SPDT 10A/7.5A |
| 13 K2, K3, K8, K9, K10, K11 | 030-30495-000 | RELAY, SS RELAY, 2A@24VDC |
| 14 | 032-30508-000 | CIRCUIT BREAKER 2 POLE 15A DIN MT |
| 15 | 033-30779-000 | FUSE HOLDER, PHOENIX |
| 16 A16 | 044-30486-000 | POWER SUPPLY, PLC 120-240VAC |
| 17 | 044-HN2436A | POWER SUPPLY |
| 18 | 044-HB1217A | POWER SUPPLY 12V 17A |
| 19 LF1 | 050-27867-000 | LINE FILTER, 20A |
| 20 DR2 | 054-30510-000 | REGULATOR, DC MOTOR SPEED CONTROLLER |
| 21 DR4 | 054-30511-000 | REGULATOR, DC MOTOR CONTROLLER 15 HP |
| 22 A2 | 099-30485-000 | PLC, OMRON 32 I/O, NPN, STANDARD FORMAT |
| 23 K1 | 099-30496-000 | PLC EXPANSION MODULE 6 IN 4 RELAY OUT |
| 24 K17 | 194-25606-611 | DIN RAIL 10.8" |
| 25 TB4 | 194-25606-616 | DIN RAIL 15.7 |
| 26 K17 | 514-28118-000 | CONTACT, CONTROL RELAY |
| 27 | 580-30513-600 | PANEL, PLC |
| 28 | 020-30609-600 | STANDOFF, CTRL PANEL COVER |
| 29 DR1 | 020-30610-600 | STANDOFF, CTRL PANEL COVER |
| 30 | 579-30611-600 | COVER, CONTROL PANEL |
| 31 | 026-30833-601 | TIE WRAP, WIRE WAY 3.875" LG |
| 32 | 026-30833-602 | TIE WRAP, WIRE WAY 9.250" LG |
| COMPONENT | PART | DESCRIPTION |

| | NUMBER | |
|---------------------------------------|---------------|---------------------------------|
| 33 | 026-30833-603 | TIE WRAP, WIRE WAY 12" LG |
| 34 | 026-30833-604 | TIE WRAP, WIRE WAY 13.390" LG |
| 35 | 026-30833-605 | TIE WRAP, WIRE WAY 13.906" LG |
| 36 | 026-30833-606 | TIE WRAP, WIRE WAY 19.625" LG |
| 37 | 046-30498-000 | CABLE, OUTPUT, PLC TO RELAY |
| 38 DR2 | 047-S9838 | RESISTOR HORSE POWER DR2,DR4 |
| 39 DR1 | 047-S9835 | RESISTOR HOURSE POWER DR1 |
| 40 K17 | 067-27095-000 | VARISTOR, SURGE SUPPRESSOR |
| 41 TB4 | 024-26791-000 | ADJACENT JUMPER |
| 42 DR1 | 032-00005250 | FUSE, 0.5 AMP DR1 |
| 43 F4B, F7A, F7B, DR1 | 032-10010250 | FUSE, 1 AMP F4B,7A,7B,DR1 |
| 44 F3A,F3B | 032-10020250 | FUSE, 2 AMP F3A,3B |
| 45 F2A, F2B, F8B, F9A, F9B, DR4 | 032-00030250 | FUSE, 3 AMP F2A,2B,8B,9A,9B,DR4 |
| 46 F6A, F6B | 032-00050250 | FUSE, 5 AMP F6A,6B |
| 47 F5C | 032-00080250 | FUSE, 8 AMP F5C |
| 48 F5A, F5B | 032-00010250 | FUSE, 10 AMP F5A, 5B |
| 49 K4 | 030-30494-000 | RELAY, PHOTO COUPLER |

549-30123-500, FEEDER ASSEMBLY

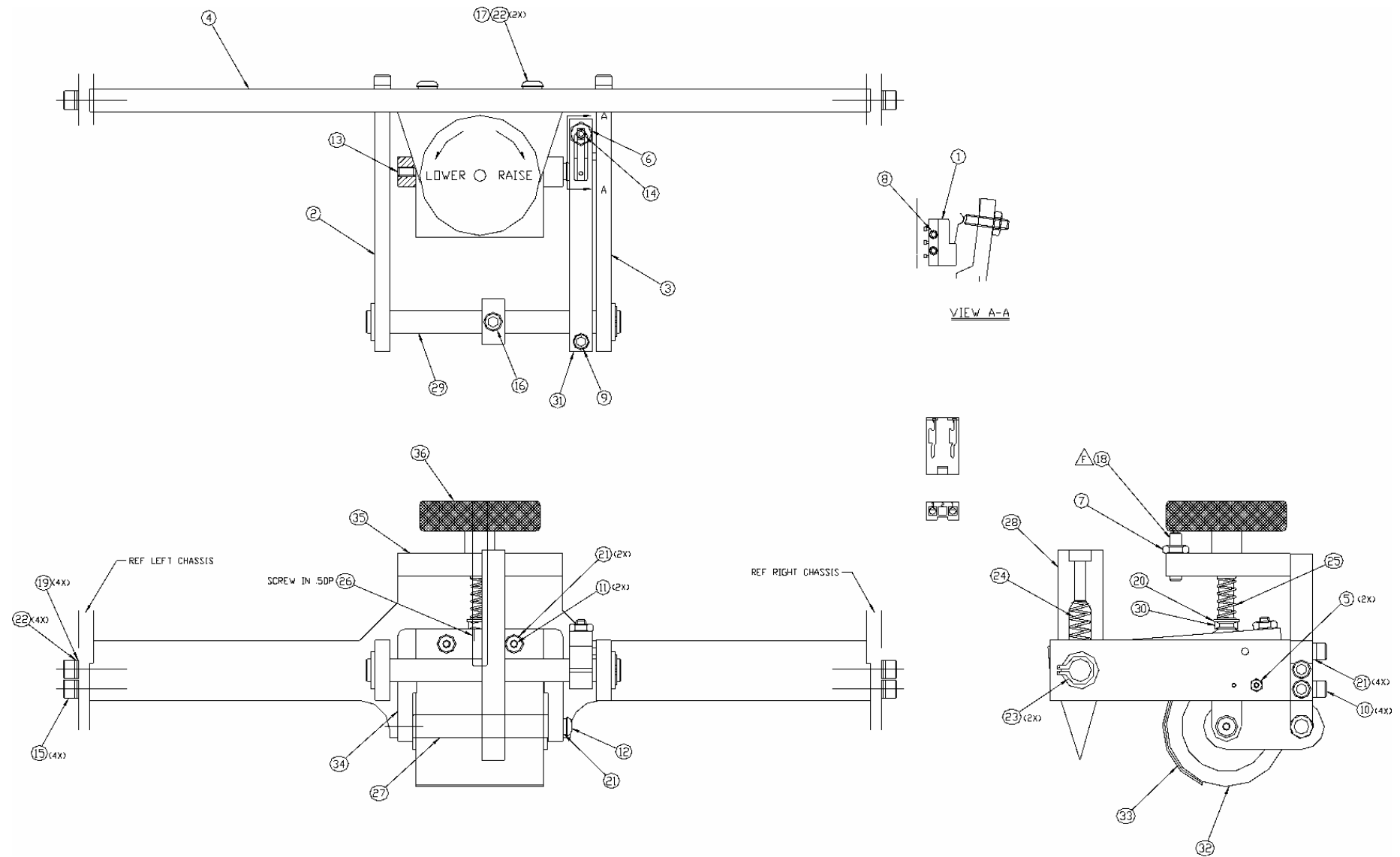




549-30123-500, FEEDER ASSEMBLY

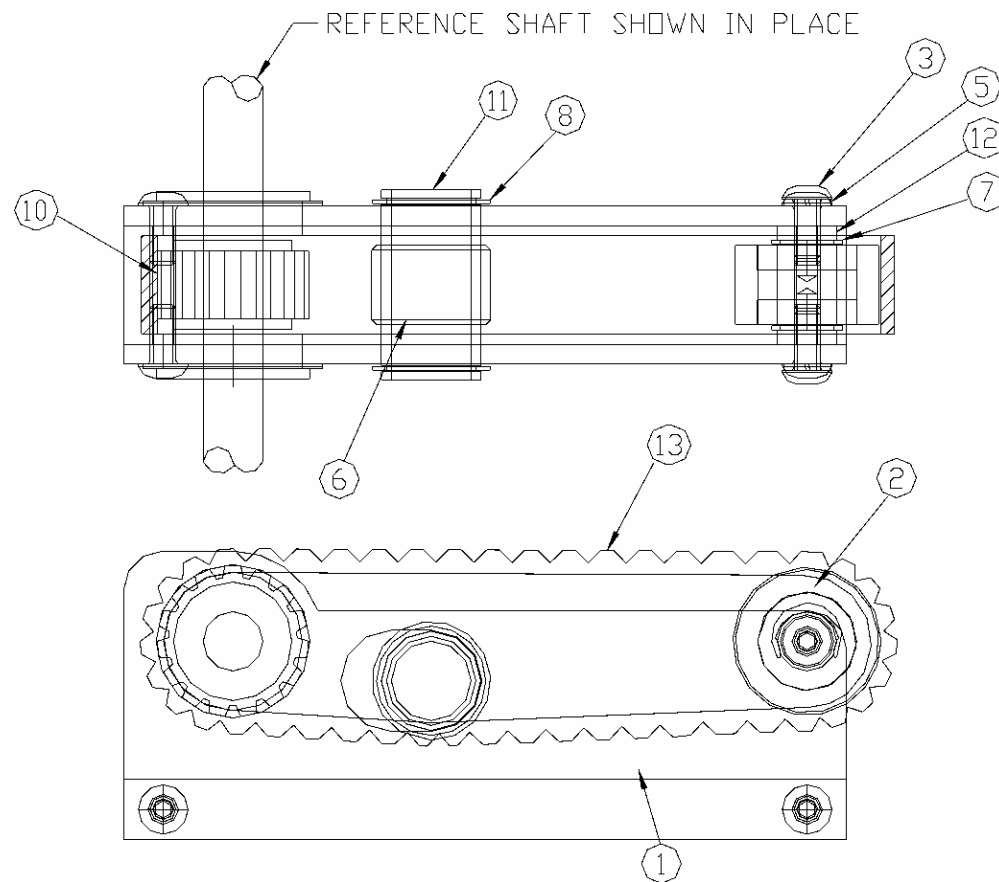
| | | | |
|-----|----------------------------------|----------------|---|
| 174 | SHAFT, AXLE SUPPORT LOWER | 020-30902-600 | 2 |
| 173 | SUPPORT, LOWER IDLER SHAFT | 020-30902-600 | 2 |
| 172 | SCREW, 10-32 X 3/4 FLAT HEAD | 014-10210102 | 2 |
| 171 | BRACKET, SENSOR, TOP | 007-30563-600 | 1 |
| 170 | SCREW, SHCS, #8-32 X 3/8 | 014-08221006 | 1 |
| 169 | WASHER, SPLIT LOCK, #4 | 016-M04008 | 1 |
| 168 | WASHER, #4 FLAT | 016-M04008 | 2 |
| 167 | SCREW, SHCS, #4 X 10 | 014-M04021010 | 1 |
| 166 | SCREW, SHCS, #4 X 28 | 014-M04021028 | 1 |
| 165 | NUT, HEX, METRIC, 4 MM | 013-M04041 | 3 |
| 164 | PULLEY ASSEMBLY | 002A-22091 | 1 |
| 163 | COLLAR, CLAMP, 3/8 ID | 123-15300 | 2 |
| 162 | SHAFT, GLUE SENSOR MOUNT | 095-30561-600 | 1 |
| 161 | CLAMP, GLUE SENSOR MOUNT | 523-30560-600 | 1 |
| 160 | KEY, WOODRUFF, 1/8 X 1/2 | 167-125500 | 1 |
| 159 | BLOCK, DOWEL MOUNTING | 320-26217-600 | 2 |
| 158 | SHCS, #8-32 X .375 | 014-08251061 | 4 |
| 157 | BEARING, 3/5 ID, .187 LONG | 152-27392-000 | 1 |
| 156 | BEARING, W/ 2 SEALS | 165-JT167 | 1 |
| 155 | SINGULATOR COVER | 579-30420-500 | 1 |
| 154 | LINK, FEEDER COVER | 108-29002-600 | 1 |
| 153 | MAGNET | 041-35701 | 2 |
| 152 | GAS SPRING, 30 LB | 181-29019-000 | 1 |
| 151 | PULLOUT ROLLER | 6008-16940 | 2 |
| 150 | STUD PLATE | 6008-16935 | 1 |
| 149 | BRACKET, MTG, SAFETY SWITCH | 007-28628-600 | 1 |
| 148 | PLATE, DISPLAY MOUNTING | 584-30576-600 | 1 |
| 147 | BRACKET, DISPLAY MOUNTING | 007-30577-600 | 2 |
| 146 | DRIVE ROLLER RIGHT | 176-27197-501 | 1 |
| 145 | DRIVE ROLLER LEFT | 176-27197-500 | 1 |
| 144 | ROLLER BEARING, HUB | 6008-16404-005 | 1 |
| 143 | HOPPER FEED SHAFT | 6008-16122-033 | 1 |
| 142 | RAIL OUTPUT HOLD DOWN | 6008-16122-023 | 2 |
| 141 | BELT SUPPORT SHAFT | 6008-16122-018 | 1 |
| 140 | FRONT UPPER AXLE | 6008-16122-014 | 1 |
| 139 | FRONT LOWER AXLE | 6008-16122-013 | 1 |
| 138 | LEFT EXTENSION PLATE | 6008-16122-012 | 1 |
| 137 | RIGHT EXTENSION PLATE | 6008-16122-011 | 1 |
| 136 | UPPER BELT | 118-27274-600 | 3 |
| 135 | LOWER BELT | 118-30904-600 | 3 |
| 134 | TRACK BUTTON | 6008-15839-068 | 1 |
| 133 | FEED DRIVE PULLEY | 112-30426-600 | 1 |
| 132 | ADAPTOR PLATE | 6008-22223 | 1 |
| 131 | TENSIONER SHAFT | 6008-15839-017 | 2 |
| 130 | MIDDLE TIE PLATE | 6008-15839-003 | 1 |
| 129 | SINGULATOR DRIVE SHAFT | 095-27195-600 | 1 |
| 128 | REDUCTION PULLEY MOUNT | 600A-21521 | 1 |
| 127 | BRACKET, SENSOR MOUNT, TOP | 007-30564-600 | 1 |
| 126 | DRIVE PULLEY SHAFT | 600A-17661 | 1 |
| 125 | WORM GEAR ASSEMBLY | 600A-16556 | 2 |
| 124 | DRIVE PULLEY | 600A-16349-020 | 4 |
| 123 | LOCATING NUT | 320-30424-600 | 1 |
| 122 | TENSION ADJUST SHAFT | 600A-16122-027 | 2 |
| 121 | SPACER BLOCK | 600A-16122-024 | 2 |
| 119 | T-BLOCK, GLUE GUN MOUNT | 320-30621-015 | 2 |
| 118 | SPRING PRESSURE SCREW | 600A-15915-025 | 2 |
| 117 | TRACK BUTTON INSERT | 600A-15839-119 | 4 |
| 116 | BLOCK, GLUE GUN SUPPORT, LEFT | 320-30620-600 | 1 |
| 115 | RAIL SUPPORT SHAFT | 600B-22431 | 2 |
| 114 | BUSHING STUD GUIDE | 600A-15839-012 | 2 |
| 113 | RIGHT PAPER GUIDE RAIL | 592-27245-500 | 1 |
| 112 | LEFT PAPER GUIDE RAIL | 592-27246-500 | 1 |
| 111 | FIELDER TRAY | 579-30594-600 | 2 |
| 110 | SIDE BEARING BLOCK | 547-27174-600 | 1 |
| 109 | FRAME, RIGHT | 547-27173-600 | 1 |
| 108 | FRAME, LEFT | 516-25334-600 | 2 |
| 106 | RAIL GUIDE | 516-25333-600 | 2 |
| 105 | PLATE, CLAMPING | 584-30622-600 | 2 |
| 104 | BLOCK, GLUE GUN SUPPORT, RIGHT | 320-30619-600 | 1 |
| 103 | HOUSING, GLUE GUN, RIGHT | 556-30479-600 | 1 |
| 102 | HOUSING, GLUE GUN, LEFT | 556-30480-600 | 1 |
| 101 | COMPRESSION SPRING | 181-3600401000 | 4 |
| 100 | BUMPER RUBBER | 173-2194 | 8 |
| 99 | BRACKET, GLUE GUN STOP | 007-30450-600 | 2 |
| 98 | BRACKET, SENSOR BOTTOM | 007-30565-600 | 1 |
| 96 | RADIAL BEARING | 158-S3PPRESST | 7 |
| 95 | BEARING FLANGE | 153-F86103 | 2 |
| 94 | BEARING, SLEEVE, 3/8 X 1/2 X 3/4 | 152-B683 | 1 |
| 93 | BLOCK, MOUNTING | 320-26332-600 | 2 |
| 92 | COLLAR SET SCREW | 126-2X737 | 1 |
| 91 | COLLAR | 126-SC25 | 4 |
| 90 | CLAMP COLLAR, 3/5 ID | 123-6AL | 4 |
| 89 | BELT TIMING | 113-S29DL100 | 1 |
| 88 | BELT TIMING | 113-20020037 | 1 |
| 87 | BELT TIMING | 113-200290037 | 1 |

| | | | |
|------|-----------------------------------|-----------------|-------|
| 86 | BELT TIMING | 113-200290037 | 1 |
| 85 | BELT TIMING | 113-2000803712 | 1 |
| 84 | PULLEY TIMING, 30T | 112-200DBA30637 | 2 |
| 83 | KEYBOARD ASSEMBLY | 580-30636-500 | 1 |
| 82 | PULLEY TIMING, 18T | 112-200DBA18650 | 1 |
| 81 | PULLEY TIMING, 16T | 112-200DBA16637 | 1 |
| 80 | WORM GEAR | 104-1HSN24 | 2 |
| 79 | ----- | ----- | ----- |
| 78 | MAGNETIC REED SWITCH | 041-28020-500 | 1 |
| 77 | COVER, FEEDER HOPPER LOWER | 579-30385-600 | 1 |
| 76 | COVER, FEEDER DRIVE BELT | 579-30386-600 | 1 |
| 75 | BRACKET, FEEDER LOWER COVER | 007-30387-600 | 2 |
| 74 | SPARE | 025-M1006 | 2 |
| 73 | STATIC BRAID ASSEMBLY | 025-25947-500 | 1 |
| 72 | ----- | ----- | ----- |
| 71 | STANDOFF, #10-32 X 20 | 020-RA0120632 | 1 |
| 70 | BHSCS, #8-32 X 3/8 | 014-08241006 | 10 |
| 69 | STANDOFF, HEX, #10-32 X 1-3/8 | 020-HA01021022 | 4 |
| 68 | RETAINING RING | 019-31362 | 4 |
| 67 | SHIM, 501D, 125 THICK | 016-50500075012 | 1 |
| 66 | SHIM, 3751D, 125 THICK | 016-50375062912 | 1 |
| 65 | SHIM, 3751D, 093 THICK | 016-50375062509 | 1 |
| 64 | SHIM, 3751D, 032 THICK | 016-50375062503 | 1 |
| 63 | WASHER, CUP, .25 | 016-712 | 2 |
| 62 | SPRING CLIP, 3/8 SHAF | 026-450937372C | 2 |
| 61 | WASHER, LOCK, #10 | 016-125 | 4 |
| 60 | WASHER, LOCK, #8 | 016-110 | 36 |
| 59 | WASHER, LOCK, #6 | 016-106 | 12 |
| 58 | SCREW, SHCS, 1/4-20 X 1" | 014-25021016 | 2 |
| 57 | WASHER, FLAT, .25 | 016-025 | 4 |
| 56 | WASHER, FLAT, #10 | 016-008 | 25 |
| 55 | WASHER, FLAT, #8 | 016-008 | 3 |
| 54 | WASHER, FLAT, #6 | 016-006 | 8 |
| 53 | SHCS, #10-32 X 1.00 | 014-25021110 | 4 |
| 52 | SHCS, #10-32 X 1.25 | 014-08221102 | 2 |
| 51 | SHCS, #10-32 X 1.50 | 014-08221108 | 12 |
| 50 | HEX HEAD BOLT, #10-32 X 1.00 | 002A-16457-014 | 4 |
| 49 | RETAINING RING | 019-100031 | 6 |
| 48 | SHCS, #10-32 X .25 | 014-1025104 | 4 |
| 47 | BHSCS, #10-32 X .625 | 014-10241110 | 4 |
| 46 | BHSCS, #10-32 X 1.00 | 014-10241116 | 2 |
| 45 | BHSCS, #10-32 X 1.25 | 014-10241132 | 2 |
| 44 | BHSCS, #10-32 X 1.50 | 014-10241132 | 2 |
| 43 | BHSCS, #10-32 X 1.75 | 014-10241132 | 2 |
| 42 | BHSCS, #10-32 X 2.00 | 014-10241132 | 2 |
| 41 | BHSCS, #10-32 X 2.25 | 014-10241132 | 2 |
| 40 | BHSCS, #10-32 X 2.50 | 014-10241132 | 2 |
| 39 | BHSCS, #10-32 X 2.75 | 014-10241132 | 2 |
| 38 | BHSCS, #10-32 X 3.00 | 014-10241132 | 2 |
| 37 | BHSCS, #10-32 X 3.25 | 014-10241132 | 2 |
| 36 | THUMBSCREW, #8-32 X 1.50 | 002A-16457-014 | 4 |
| 35 | BHSCS, #10-32 X 3/8 | 014-10241006 | 12 |
| 34 | SHCS, #8-32 X 1.00 BRASS TIP | 014-06251030 | 6 |
| 33 | SHCS, #8-32 X 1.25 BRASS TIP | 014-06251030 | 6 |
| 32 | BHSCS, #8-32 X 1.50 | 014-08241108 | 1 |
| 31 | HEX HEAD BOLT, 3/16-18 X .50 | 014-3186C008 | 2 |
| 30 | BHSCS, #6-32 X .375 | 014-06241106 | 9 |
| 29 | THRUST BEARING, .06 TH | 152-TB812 | 1 |
| 28 | SHCS, #6-32 X .375 | 014-06221106 | 4 |
| 27 | PHMS, #6-32 X .375 | 014-06200006 | 4 |
| 26 | PHMS, #6-32 X .187 | 014-06200003 | 2 |
| 25 | PIVOT BRACKET | 007-27194-600 | 2 |
| 24 | SCREW, SHCS, #8-32 X 1/2 | 014-08211008 | 4 |
| 23 | NUT, #10-32 NYLOCK | 013-2102 | 4 |
| 22 | HEX NUT, #4-40 | 013-0040 | 3 |
| 21 | SPRING PLUNGER, 1/4-20 HAND RETR. | 586-30627-000 | 2 |
| 20 | PLASTIC KNOB | 008-11318K4 | 2 |
| 19 | BRACKET GLUE GUN, RIGHT | 007-30451-600 | 1 |
| 18 | BRACKET GLUE GUN, LEFT | 584-30453-600 | 1 |
| 17 | GUN MOUNTING BRACKET | 007-24249-600 | 2 |
| 16 | SINGULATOR ASSEMBLY | 549-27265-500 | 1 |
| 15 | SENSOR, DOUBLE FEED DETECT | 057-30548-000 | 1 |
| 14 | GUIDE, MOTOR COOLING AIR | 144-30593-600 | 1 |
| 13 | PULLEY ASSEMBLY | 002B-22221 | 1 |
| 12 | OUTSIDE FEED BELT'S ASSEMBLY | 002B-21905 | 2 |
| 11 | PULLEY ASSEMBLY | 002B-16767 | 6 |
| 10 | BEARING BLOCK ASSEMBLY | 320-30425-600 | 1 |
| 9 | FRICITION CLUTCH ASSEMBLY | 122-27256-500 | 1 |
| 8 | DRIVE SHAFT ASSEMBLY | 095-25312-600 | 1 |
| 7 | GROUND WIRE ASSEMBLY | 045-28853-500 | 1 |
| 6 | ENCODER ASSEMBLY | 002B-08630 | 1 |
| 5 | PLATE, MOTOR MOUNT | 584-27290-600 | 1 |
| 4 | FEEDER MOTOR | 027-28938 | 1 |
| 3 | TRANSFER SHAFT ASSEMBLY | 6008-17848 | 1 |
| 2 | PULLEY ASSEMBLY | 002A-16437 | 1 |
| 1 | CONVEYOR RAMP IDLER | 002A-16331 | 3 |
| ITEM | DESCRIPTION | PART NUMBER | QTY |

549-30421-500, SINGULATOR ASSEMBLY

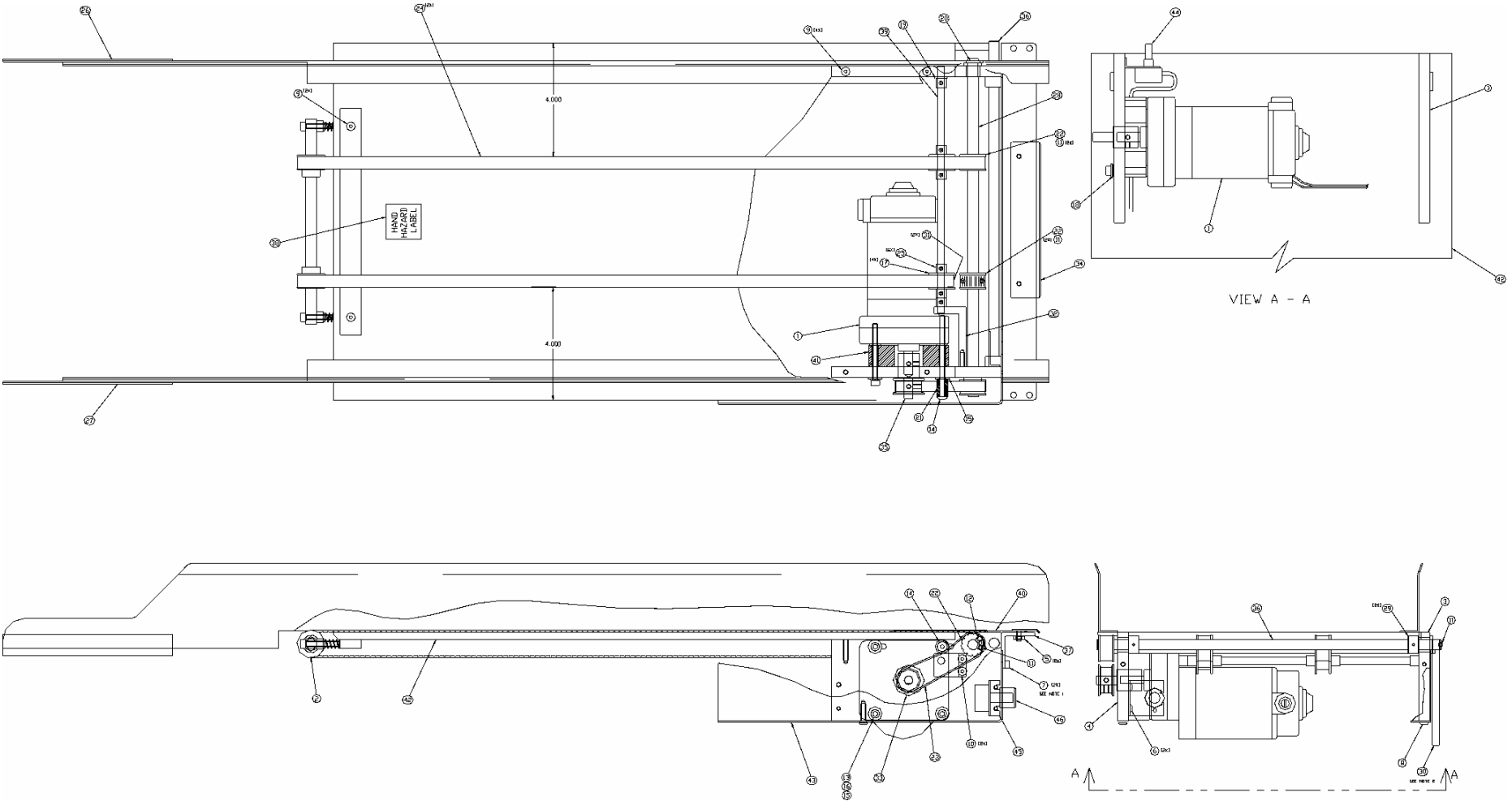
549-30421-500, SINGULATOR ASSEMBLY

| | 36 | SINGULATOR ADJUSTING KNOB | 600B-16435-009 | 1 |
|------|------|--------------------------------|-----------------|------|
| | 35 | PLATE, ADJUSTING | 600B-16435-008 | 1 |
| | 34 | ADJUSTING FORK | 600B-16435-007 | 1 |
| | 33 | GUARD, ROLLER | 600B-16435-002 | 1 |
| | 32 | SINGULATOR ROLLER | 177-25913-600 | 1 |
| | 31 | STACK SWITCH ACTUATOR | 600B-15915-044 | 1 |
| | 30 | NUT 1/4-56 | 600A-16914 | 1 |
| | 29 | PAPER DETENT AXLE | 600A-16435-006 | 1 |
| | 28 | WAND, PAPER DETENT | 600A-16435-005 | 1 |
| | 27 | ROLLER AXLE | 600A-16435-004 | 1 |
| | 26 | ADJUSTING SCREW .25-56 | 600A-16435-003 | 1 |
| | 25 | SPRING | 181-05000808125 | 1 |
| | 24 | SPRING, COMPRESSION | 181-03000301000 | 1 |
| | 23 | RING, RETAINING EXTERNAL GRIP | 019-710037 | 1 |
| | 22 | WASHER, LOCK #10 | 016-110 | 6 |
| | 21 | WASHER, LOCK #8 | 016-108 | 7 |
| | 20 | WASHER, FLAT 1\4 | 016-025 | 1 |
| | 19 | WASHER, FLAT #10 | 016-010 | 4 |
| | 18 | SCREW, ADJUSTING #10 | 014-SW15 | 1 |
| | 17 | SCREW, BHSCS #10-32 X 7/8 | 014-10241114 | 2 |
| | 16 | SCREW, SHCS #10-32 X 2" | 014-10221132 | 1 |
| | 15 | SCREW, SHCS #10-32 X 3/4 | 014-10221012 | 4 |
| | 14 | SCREW, SHSS #8-32 X 3/4 | 014-08251112 | 1 |
| | 13 | SCREW, SHSS #8-32 X 1/4, BRASS | 014-082511040 | 1 |
| | 12 | SCREW, BHSCS #8-32 X 5/8 | 014-08241110 | 1 |
| | 11 | SCREW, BHSCS #8-32 X 3/8 | 014-08241006 | 2 |
| | 10 | SCREW, SHCS #8-32 X 3/4 | 014-08221012 | 4 |
| | 9 | SCREW, SHCS #8-32 X 1/2 | 014-08221008 | 1 |
| | 8 | SCREW, PHMS #2-56 X 1/2 | 014-02600008 | 2 |
| | 7 | NUT, HEX #10 | 013-0102 | 1 |
| | 6 | NUT, HEX #8 | 013-0082 | 1 |
| | 5 | NUT, HEX #2-56 | 013-0026 | 2 |
| | 4 | SUPPORT BAR ASSEMBLY | 002C-16500 | 1 |
| | 3 | INFED SWITCH BRACKET | 002B-16326 | 1 |
| | 2 | INPUT BRACKET ASSEMBLY | 002B-16325 | 1 |
| | 1 | CREEPER MOTOR SWITCH ASSY | 041-27648-500 | 1 |
| REV. | ITEM | DESCRIPTION | PART NUMBER | QTY. |

002B-21905, AUXILIARY FEED BELTS

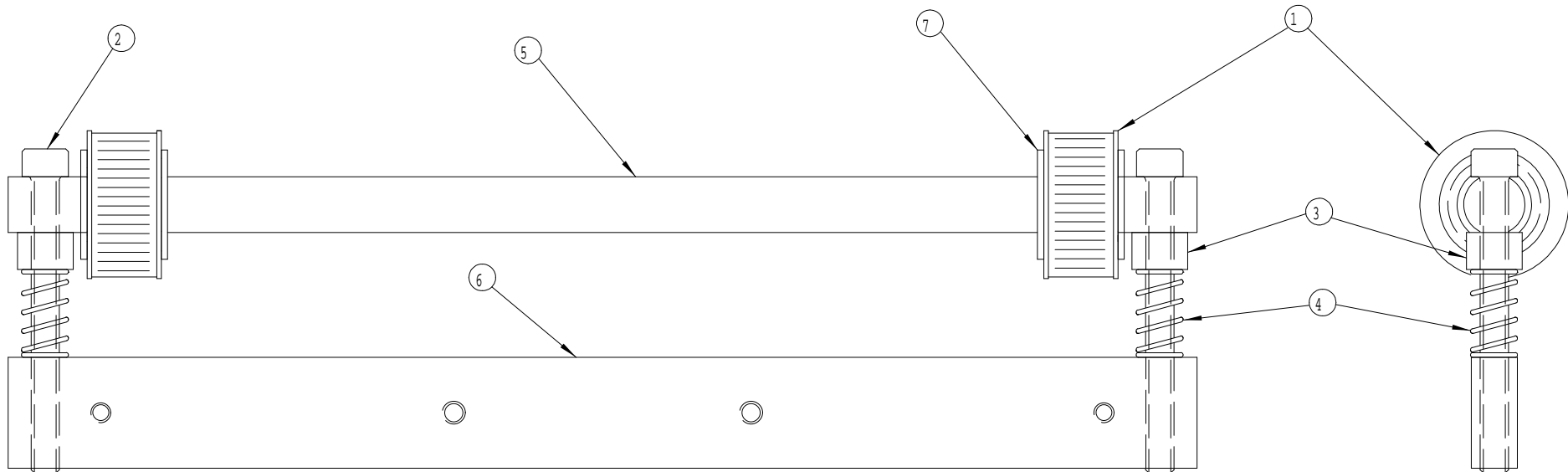
| | | | | |
|------|------|------------------------------------|-----------------------------|------|
| | 13 | BELT, TRACTOR, AUX DRIVE | 118-30307-600 | 1 |
| | 12 | AXLE | 600A-21909 | 1 |
| | 11 | BUSHING MODIFICATION | 600A-21908 | 1 |
| | 10 | PULLEY | 600A-20965 | 1 |
| | 9 | TRACTOR BELT — OBSOLETE | 186-2823500088 — | REF |
| | 8 | RETAINING RING | 019-200062 | 2 |
| | 7 | RETAINING RING | 019-200037 | 2 |
| | 6 | IDLER ROLLER | 600A-22189 | 1 |
| | 5 | #8 LOCK WASHER | 016-108 | 2 |
| | 4 | SHSS 8-32 X 3/16 | 014-08251103 | 2 |
| | 3 | BHSCS 8-32 X 3/8 | 014-08241106 | 2 |
| | 2 | ROLLER ASSEMBLY | 002A-21927 | 1 |
| | 1 | HOUSING ASSEMBLY | 002B-21906 | 1 |
| REV. | ITEM | DESCRIPTION | PART NUMBER | QTY. |

750-28557-500, CREEPER CONVEYOR



750-28557-500, CREEPER CONVEYOR

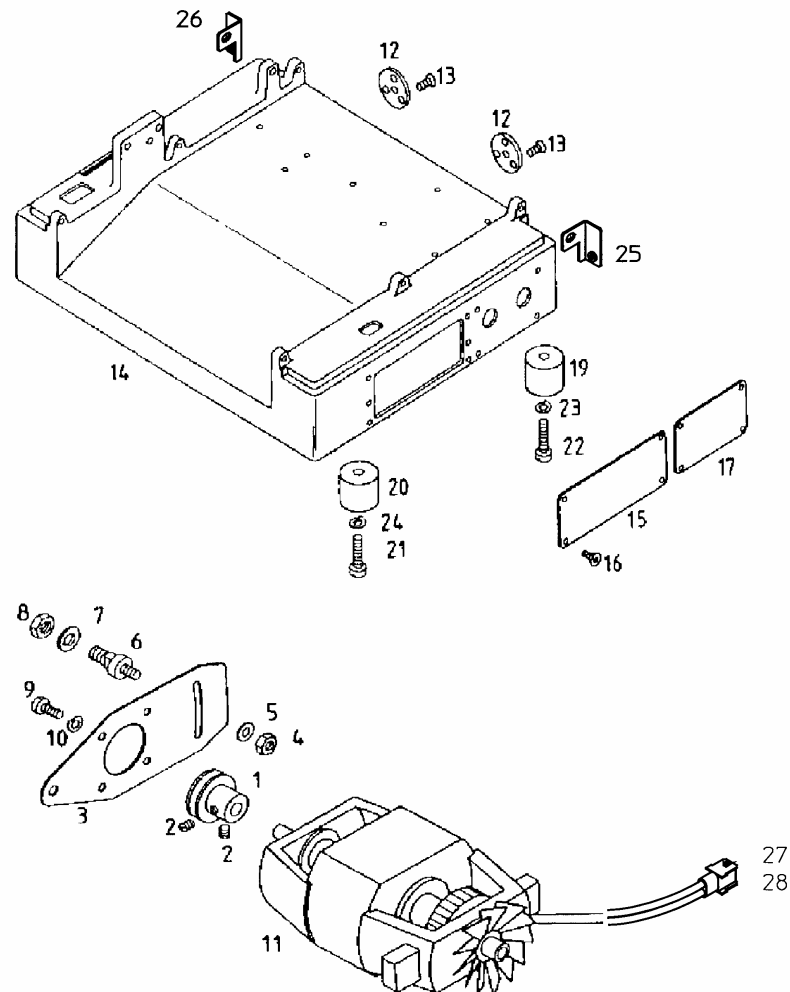
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|------|------------------------------|-----------------|-------------|------|
| 46 | KNOB | 008-DS7018D2 | 1 | |
| 45 | BRACKET | 600A-23337 | 1 | |
| 44 | SPEED PNT ASSEMBLY | 049-28585-500 | 1 | |
| 43 | REAR CREEPER COVER | 600D-23346 | 1 | |
| 42 | BED | 600C-15841-001 | 1 | |
| 41 | MOTOR SPACER | 600B-23483 | 1 | |
| 40 | MYLAR COVER | 600B-23475 | 1 | |
| 39 | SHAFT | 600B-23368 | 1 | |
| 38 | LABEL, HAND HAZARD | 600B-17436-004 | 1 | |
| 37 | LOCK ANGLE | 600B-15841-019 | 1 | |
| 36 | TENSION BAR | 600B-15841-014 | 1 | |
| 35 | COUPLING | 600A-23482 | 1 | |
| 34 | CLIP | 584-29075-600 | 1 | |
| 33 | PULLEY MOD | 600A-23367 | 1 | |
| 32 | BRACKET | 600A-23344 | 1 | |
| 31 | ROLLER | 600A-16652 | 2 | |
| 30 | HANDLE | 600A-15841-020 | 1 | |
| 29 | ECCENTRIC LOCK | 600A-15841-015 | 2 | |
| 28 | DRIVE SHAFT | 600A-15841-009 | 1 | |
| 27 | STACK GUIDE, LEFT | 600C-16575-001 | 1 | |
| 26 | STACK GUIDE, RIGHT | 600C-16575-002 | 1 | |
| 25 | SET SCREW COLLAR | 126-SSC25 | 6 | |
| 24 | CONVEYOR BELT | 113-200500037 | 2 | |
| 23 | DRIVE BELT | 113-200080037 | 1 | |
| 22 | PULLEY,TIMING,14T | 112-200NDA14638 | 3 | |
| 21 | STANDOFF,NYLON,#10CL,625 LG | 020-RN010C0610 | 1 | |
| 20 | RETAINING RING | 019-710037 | 1 | |
| 19 | WASHER,WAVY,.25 | 016-525 | 1 | |
| 18 | WASHER,STAR,#10 | 016-310 | 1 | |
| 17 | WASHER,FENDER,.25 | 016-225 | 4 | |
| 16 | WASHER,LOCK,#10 | 016-110 | 3 | |
| 15 | WASHER,FLAT,#10 | 016-010 | 4 | |
| 14 | BHSCS,#10-32 X 3.00 | 014-10221148 | 1 | |
| 13 | SHCS,#10-32 X 2.00 | 014-10221132 | 3 | |
| 12 | SHSS,#8-32 x .187 | 014-08251103 | 1 | |
| 11 | SHSS,#8-32 X .125, BRASS TIP | 014-082511020 | 6 | |
| 10 | BHSCS,#8-32 x .75 | 014-08241112 | 2 | |
| 9 | BHSCS,#8-32 X .50 | 014-08241108 | 6 | |
| 8 | BHSCS,#8-32 x .375 | 014-08241106 | 2 | |
| 7 | SHCS,#8-32 x .75 | 014-08221112 | 2 | |
| 6 | BHSCS,#6-32 x .25 | 014-06241104 | 2 | |
| 5 | NUT,NYLOCK,#8-32 | 013-2082 | 2 | |
| 4 | LEFT MOUNTING PLATE | 002B-23381 | 1 | |
| 3 | RIGHT MOUNTING PLATE | 002B-23380 | 1 | |
| 2 | FRONT SHAFT ASSEMBLY | 002B-16631 | 1 | |
| 1 | MOTOR ASSEMBLY | 027-28583-500 | 1 | |
| REV. | ITEM | DESCRIPTION | PART NUMBER | QTY. |

002B-16631, FRONT SHAFT ASSEMBLY

002B-16631, FRONT SHAFT ASSEMBLY

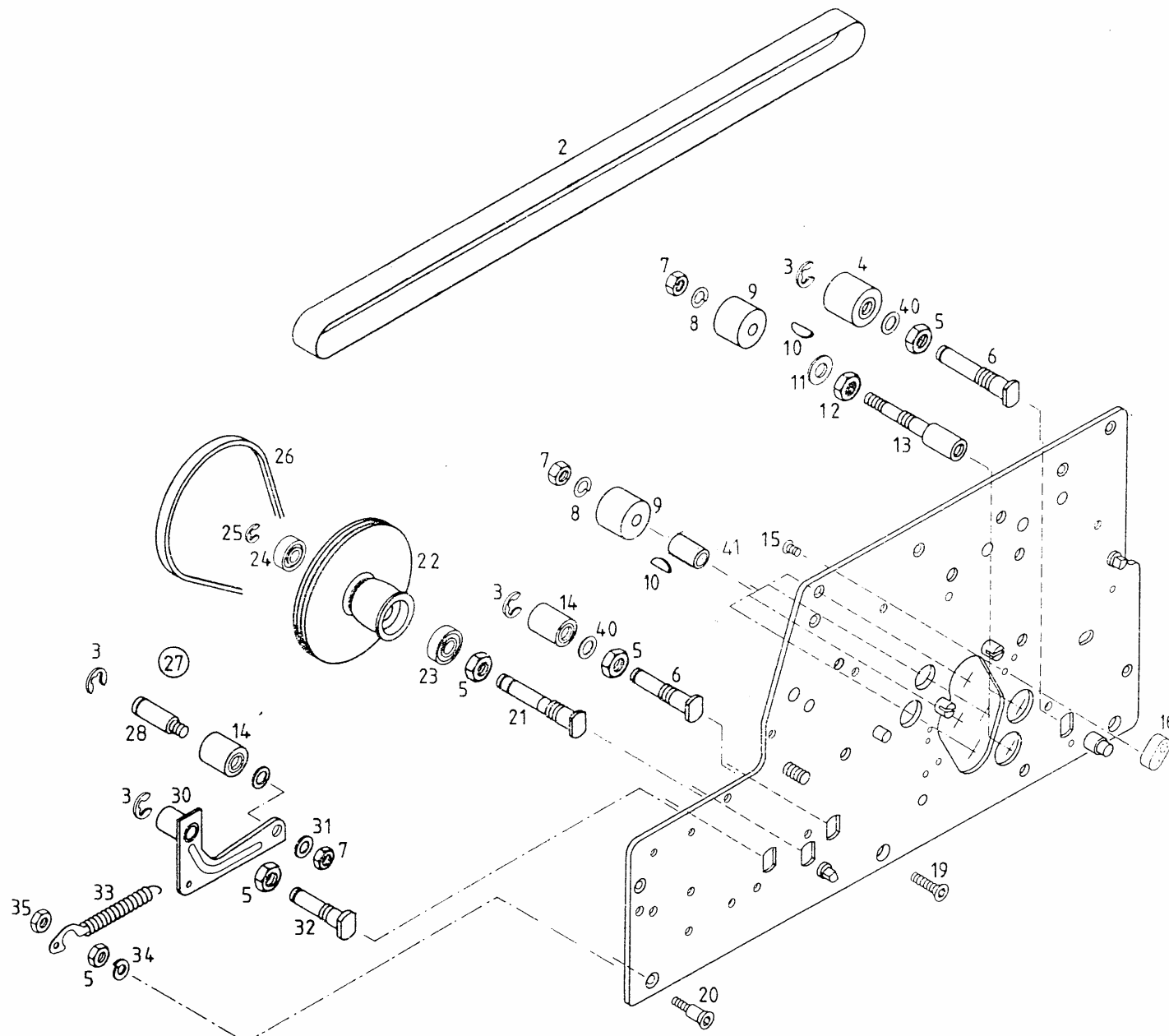
| INDEX | PART NUMBER | DESCRIPTION |
|-------|-----------------|--------------------|
| 1 | 112-26947-500 | IDLER PULLEY |
| 2 | 014-10221132 | SHCS,#10-32 X 2.00 |
| 3 | 020-RN010C0604 | SPACER,#10CL,.25" |
| 4 | 181-03000401000 | SPRING |
| 5 | 600A-15841-008 | FRONT SHAFT |
| 6 | 600B-15841-007 | FRONT SHAFT BRACE |
| 7 | 019-710037 | RETAINING RING |

703-27277-500, FOLDER, 4 PLATE, PAGE 1



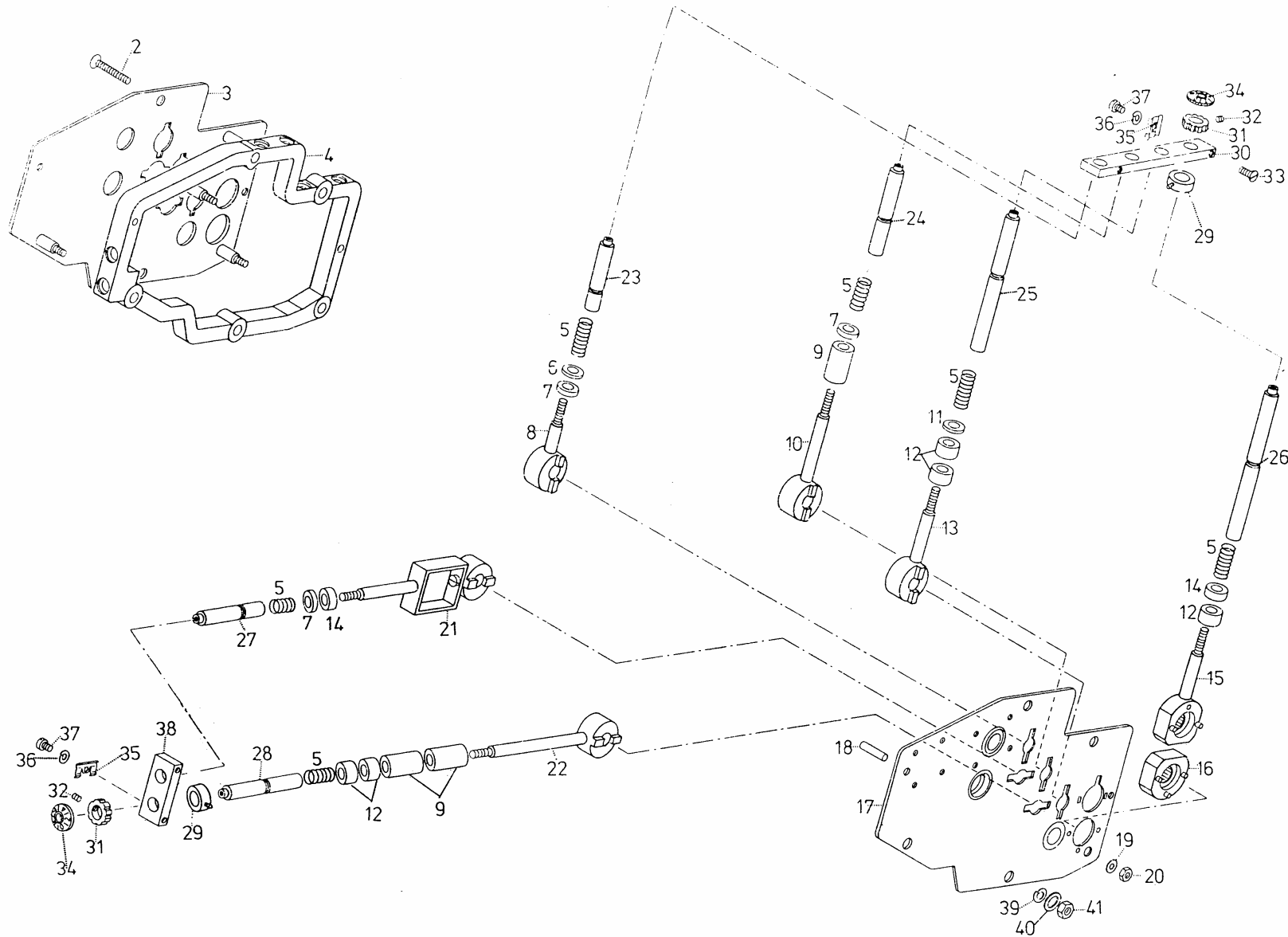
703-27277-500, FOLDER, 4 PLATE, page 1

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|-------------------|
| 1 | 117-27578-000 | PULLEY |
| 2 | 014-08251105 | SHSS,#8-32 X .312 |
| 3 | 186-032021497 | MOTOR PLATE |
| 4 | 186-031122001 | HEX NUT,M6 |
| 5 | 186-031107004 | WASHER,6mm |
| 6 | 186-032011600 | STUD |
| 7 | 186-031107001 | WASHER |
| 8 | 186-031122002 | HEX NUT,M8 |
| 9 | 186-031103006 | SCREW,M5 X 12mm |
| 10 | 186-031108003 | WASHER,LOCK,M5 |
| 11 | 186-034007861 | MOTOR,230V |
| 12 | 600A-18840 | MOUNT PLATE |
| 13 | 186-031167001 | SCREW,M4 X 8mm |
| 14 | 186-032036056 | CHASSIS |
| 15 | 186-032021495 | COVER |
| 16 | 186-031170001 | SCREW,M4 X 8mm |
| 17 | XXXXXX | COVER |
| 19 | 020-27751-600 | SPACER,.812 |
| 20 | 020-27750-600 | SPACER,.750 |
| 21 | 014-M0421140 | SCREW,M4 X 40mm |
| 22 | 014-M0621140 | SCREW,M6 X 40mm |
| 23 | 016-M10600 | WASHER,LOCK,M6 |
| 24 | 016-M10400 | WASHER,LOCK,M4 |
| 25 | 007-27914-600 | COVER BRACKET |
| 26 | 007-27915-600 | COVER BRACKET |
| 27 | 039-67295001 | CONNECTOR |
| 28 | 039-76484002 | MALE PIN |

703-27277-500, FOLDER, 4 PLATE, page 2

703-27277-500, FOLDER, 4 PLATE, page 2

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|----------------------|
| 2 | 186-031031013 | FLAT BELT |
| 3 | 186-031133009 | C-CLIP |
| 4 | 186-034001363 | ROLLER |
| 5 | 186-032041074 | NUT |
| 6 | 186-032011587 | PIN |
| 7 | 186-031122002 | HEX NUT,M8 |
| 8 | 186-031108005 | WASHER,LOCK |
| 9 | 186-032011575 | PULLEY |
| 10 | 186-031135001 | WOODRUFF KEY |
| 11 | 186-031109004 | WASHER |
| 12 | 186-032041075 | NUT |
| 13 | 186-032011566 | COUPLING PIN |
| 14 | 186-034001367 | ROLLER |
| 15 | 186-031170006 | SCREW,M4 X 10mm |
| 16 | 186-034002724 | BRACKET |
| 19 | 186-031170002 | SCREW,M5 X 25mm |
| 20 | 186-032041073 | SCREW |
| 21 | 186-032011586 | PIN |
| 22 | 186-034001364 | PULLEY |
| 23 | 186-031112016 | BALL BEARING |
| 24 | 186-031112018 | BALL BEARING |
| 25 | 186-031133007 | C-CLIP |
| 26 | 116-27579-000 | POLYFLEX BELT |
| 27 | 186-034001366 | SUPPORT |
| 28 | 186-032006185 | PIN |
| 29 | 186-032021493 | WASHER |
| 30 | 186-034001365 | SUPPORT WITH BUSHING |
| 31 | 186-031107001 | WASHER |
| 32 | 186-032011588 | PIN |
| 33 | 186-034001419 | SPRING ANCHOR |
| 34 | 186-031108001 | LOCKWASHER |
| 35 | 186-031122001 | HEX NUT,M6 |
| 39 | 186-033000384 | WASHER |
| 40 | 186-032012389 | SPACER BUSHING |

703-27277-500, FOLDER, 4 PLATE, page 3

703-27277-500, FOLDER, 4 PLATE, page 3

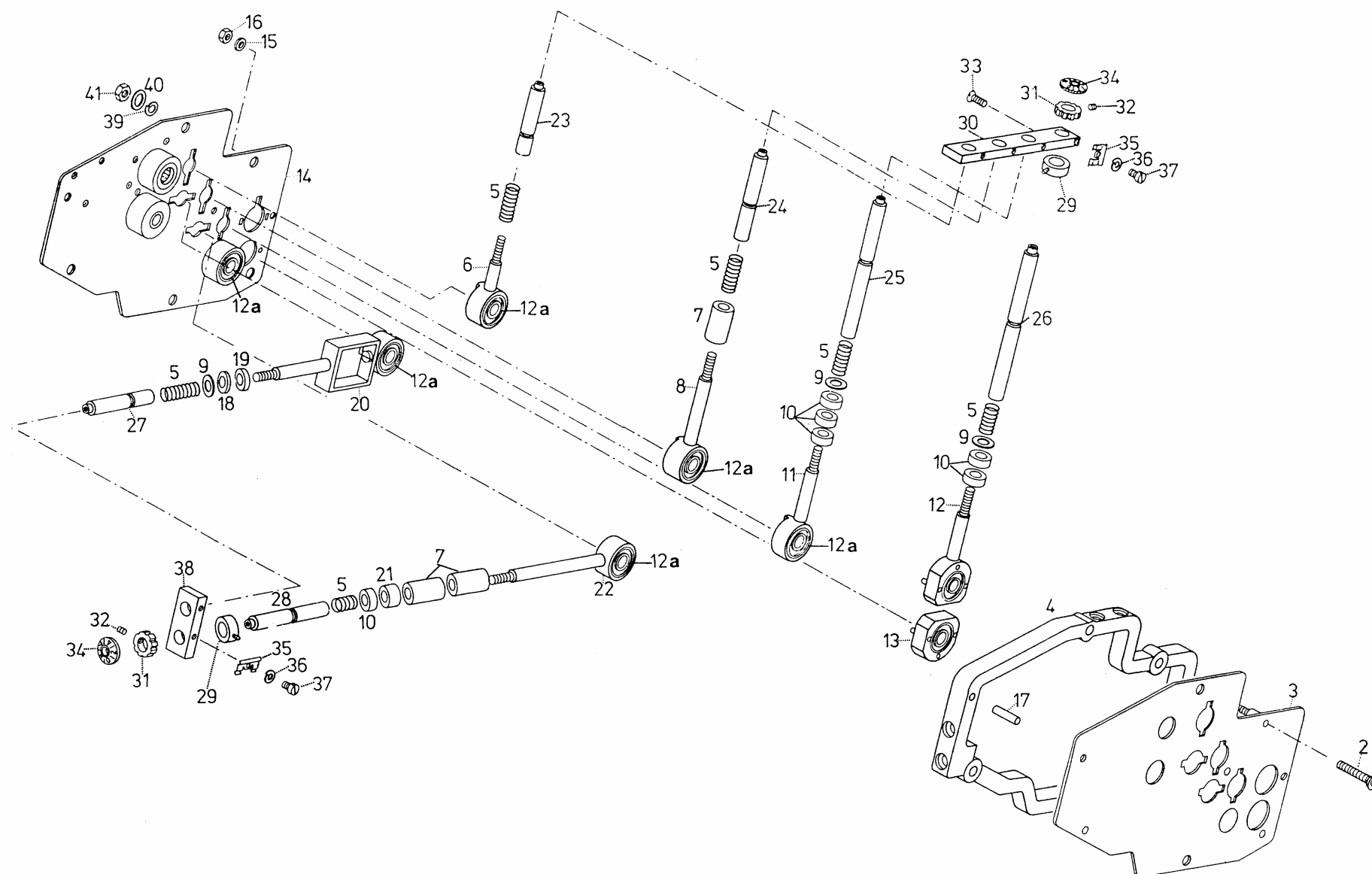
| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|-----------------------------|
| 1 | 186-034001340 | RIGHT BEARING PLATE |
| 2 | 186-031170010 | SCREW,M6 X 35mm |
| 3 | 186-034001325 | INSIDE RIGHT BEARING PLATE |
| 4 | 186-032066033 | FRAME |
| 5 | 186-031003040 | PRESSURE SPRING |
| 6 | 186-031191016 | SHIM,8mm X 14mm X .5mm |
| 7 | 186-032012385 | SPACER RING |
| 8 | 186-034001498 | RIGHT BEARING |
| 9 | 186-032012388 | SPACER BUSHING |
| 10 | 186-034001497 | RIGHT BEARING |
| 11 | 186-032021239 | WASHER |
| 12 | 186-032012387 | SPACER BUSHING |
| 13 | 186-034001496 | RIGHT BEARING |
| 14 | 186-032012386 | SPACER BUSHING |
| 15 | 186-034001308 | RIGHT BEARING |
| 16 | 186-034001307 | RIGHT BEARING |
| | 186-031052010 | NEEDLE BEARING |
| | 186-031150003 | DOWEL PIN,M6 X 8mm |
| 17 | 186-034001321 | OUTSIDE RIGHT BEARING PLATE |
| 18 | 186-031101022 | DOWEL PIN,M6 X 24mm |
| 19 | 186-031107003 | WASHER |
| 20 | 186-031122003 | HEX NUT,M5 |
| 21 | 186-034001488 | RIGHT ADJUSTMENT |
| 22 | 186-034001499 | RIGHT BEARING |
| 23 | 186-032006480 | PIN |
| 24 | 186-032006481 | PIN |
| 25 | 186-032016909 | PIN |
| 26 | 186-032016910 | PIN |
| 27 | 186-032006479 | PIN |
| 28 | 186-032006478 | PIN |
| 29 | 186-034002158 | COLLAR |
| 30 | 186-032051148 | RIGHT BAR |
| 31 | 186-032011845 | WASHER |
| 32 | 186-033500015 | SET SCREW |
| 33 | 186-031167005 | SCREW,M5 X 12mm |
| 34 | 186-031017228 | WASHER |
| 35 | 186-031007037 | STOP SPRING |
| 36 | 186-031108002 | LOCKWASHER |
| 37 | 186-031103017 | SCREW,M4 X 5mm |

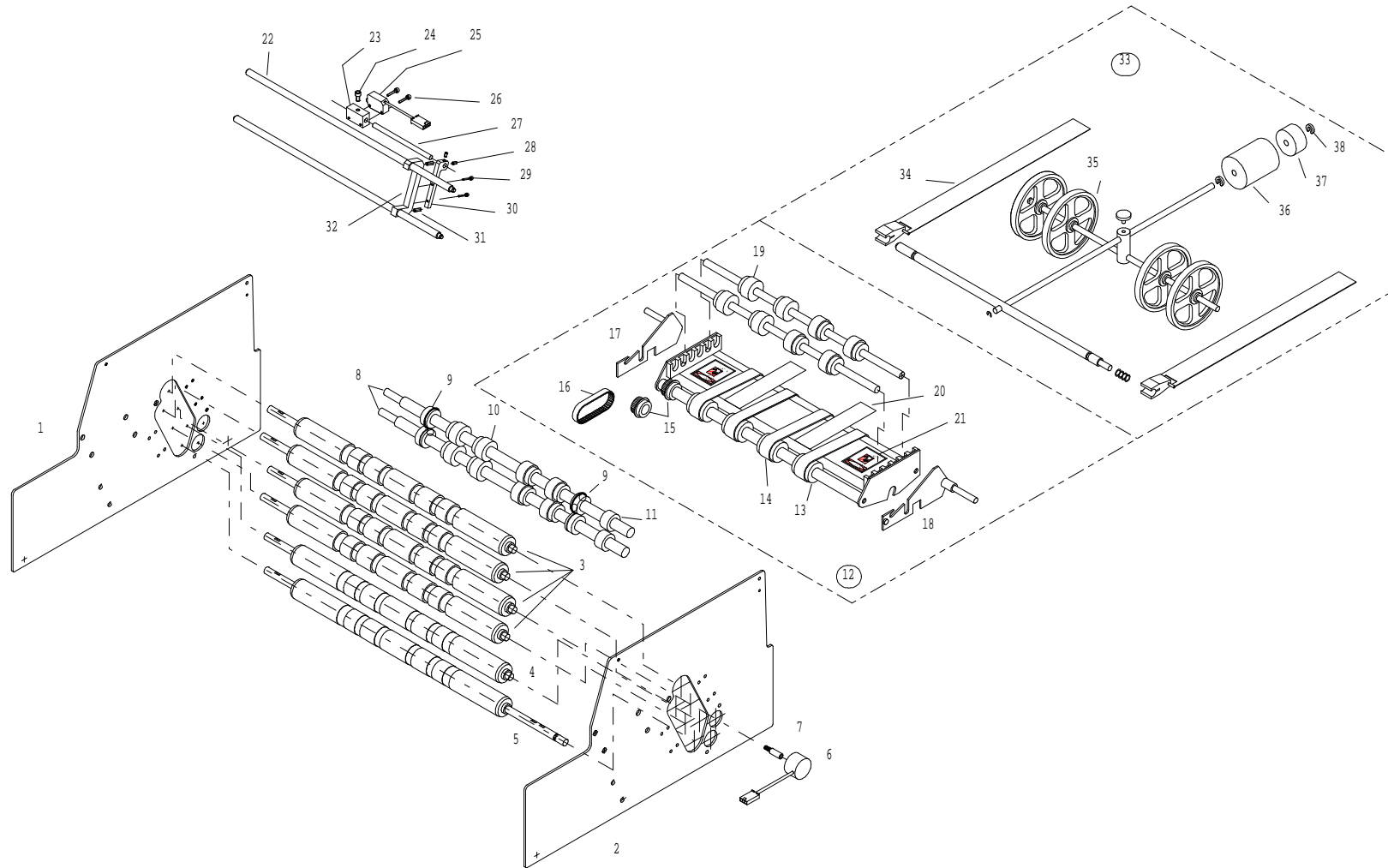
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| 38 | 186-032051149 | BAR |
| 39 | 186-031108001 | LOCKWASHER |
| 40 | 186-031107004 | WASHER |
| 41 | 186-031122002 | HEX NUT,M6 |
| 42 | 186-032022237 | WASHER |

703-27277-500, FOLDER, 4 PLATE, page 4

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|----------------------------|
| 1 | 186-034001341 | LEFT BEARING PLATE |
| 2 | 186-031170010 | SCREW,M6 X 35mm |
| 3 | 186-034001326 | INSIDE LEFT BEARING PLATE |
| 4 | 186-032066033 | FRAME |
| 5 | 186-031003040 | PRESSURE SPRING |
| 6 | 186-034001502 | LEFT BEARING |
| 7 | 186-032012388 | SPACER BUSHING |
| 8 | 186-034001501 | LEFT BEARING |
| 9 | 186-031191016 | SHIM,8mm X 14mm X .5mm |
| 10 | 186-032012386 | SPACER BUSHING |
| 11 | 186-034001500 | LEFT BEARING |
| 12 | 186-034001299 | LEFT BEARING |
| 12a | 186-031112016 | BALL BEARING |
| 13 | 186-034001300 | LEFT BEARING |
| 14 | 186-034001322 | OUTSIDE LEFT BEARING PLATE |
| 15 | 186-031107003 | WASHER |
| 16 | 186-031122003 | HEX NUT,M5 |
| 17 | 186-031101022 | DOWER PIN, M6 X 24mm |
| 18 | 186-031021239 | WASHER |
| 19 | 186-032012385 | SPACER RING |
| 20 | 186-034001486 | LEFT ADJUSTMENT |
| 21 | 186-032012387 | SPACER BUSHING |
| 22 | 186-034001503 | LEFT BEARING |
| 23 | 186-032006480 | PIN |
| 24 | 186-032006481 | PIN |
| 25 | 186-032016909 | PIN |
| 26 | 186-032016910 | PIN |
| 27 | 186-032006479 | PIN |
| 28 | 186-032006478 | PIN |
| 29 | 186-034002158 | COLLAR |
| 30 | 186-032051152 | LEFT BAR |
| 31 | 186-032011845 | WASHER |
| 32 | 186-033500015 | SET SCREW |
| 33 | 186-031167005 | SCREW,M5 X 12mm |
| 34 | 186-031017228 | WASHER |
| 35 | 186-031007037 | STOP SPRING |
| 36 | 186-031108002 | LOCKWASHER |

| | | |
|----|---------------|----------------|
| 37 | 186-031103017 | SCREW,M4 X 5mm |
| 38 | 186-032051149 | BAR |
| 39 | 186-031108001 | LOCKWASHER |
| 40 | 186-031107004 | WASHER |
| 41 | 186-031122001 | HEX NUT,M6 |
| 42 | 186-032022237 | WASHER |

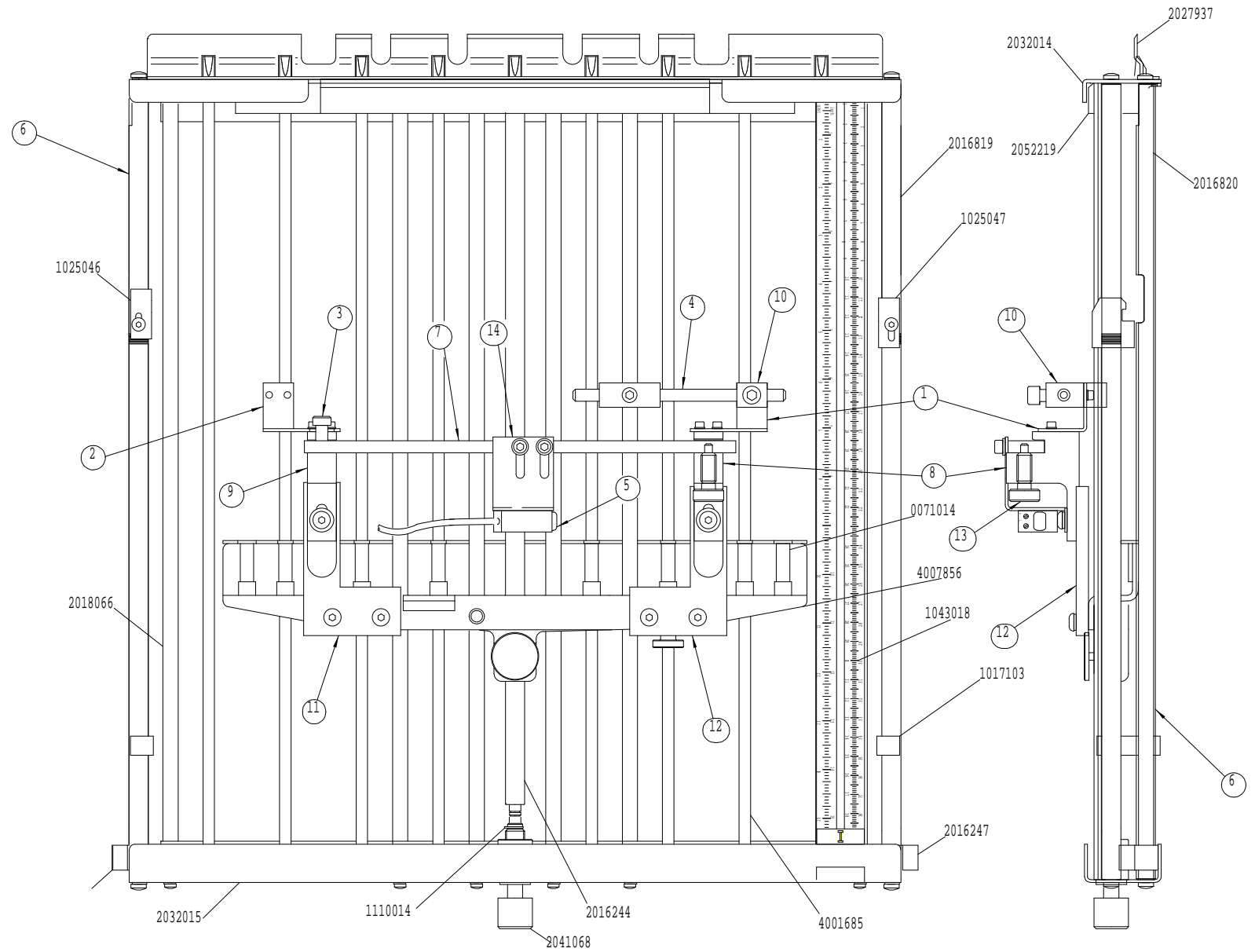




703-27277-500, FOLDER, 4 PLATE, page 5

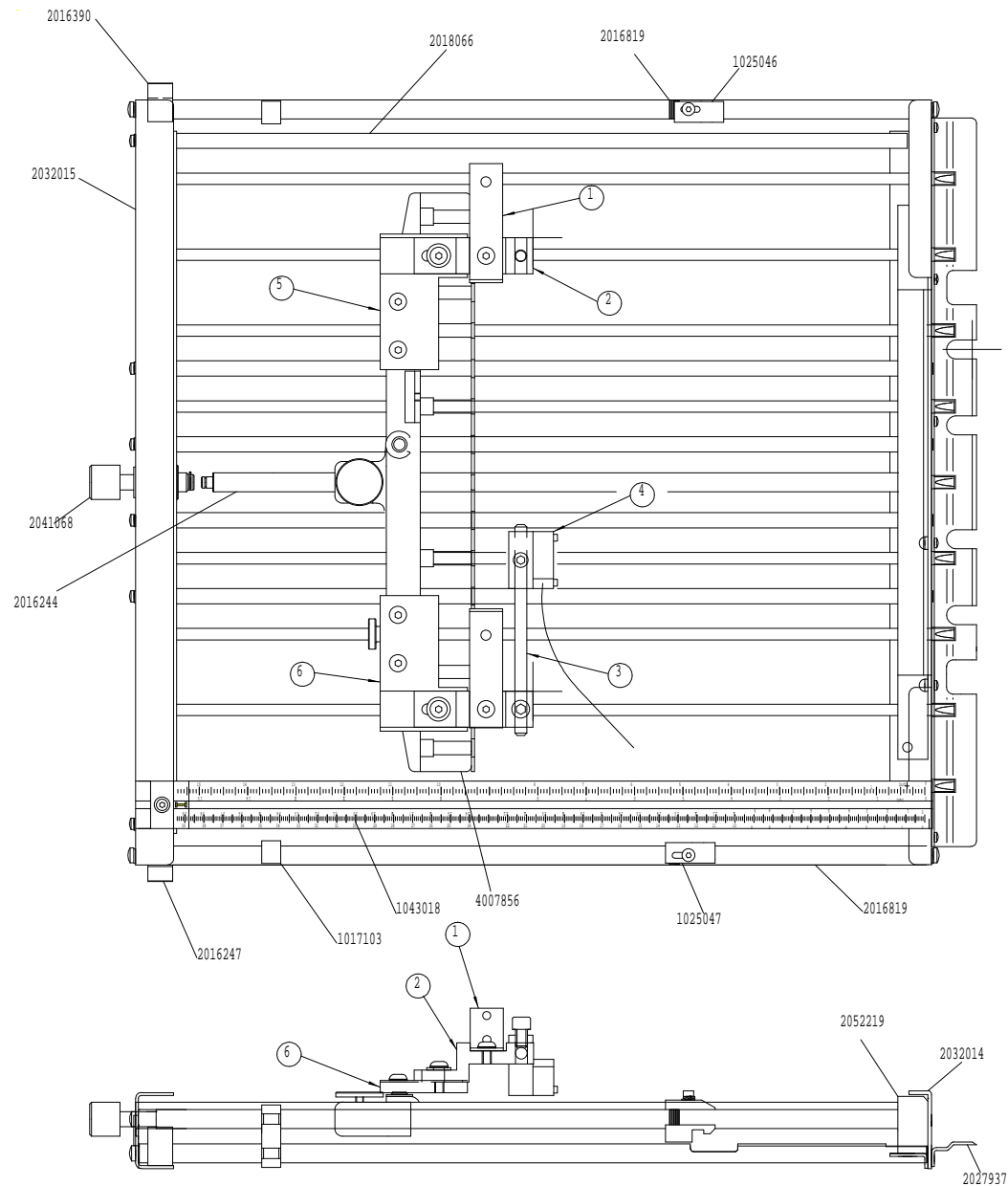
| INDEX | PART NUMBER | DESCRIPTION |
|-------|----------------|-----------------------|
| 1 | 186-034002885 | RIGHT SIDE PLATE |
| 2 | 186-034002884 | LEFT SIDE PLATE |
| 3 | 177-25119-600 | FOLD ROLLER 1,2,3,4 |
| 4 | 177-25202-600 | FOLD ROLLER 5 |
| 5 | 177-25203-600 | FOLD ROLLER 6 |
| 6 | 070-27455-500 | ENCODER ASM |
| 7 | 600A-17110 | ENCODER SHAFT ADAPTER |
| 8 | 186-032016253 | SHAFT |
| 9 | 186-039100020 | PERFORATION KNIFE SET |
| 10 | 186-033500019 | ROLLER |
| 11 | 186-034001606 | COLLAR BUSHING |
| 12 | 186-035500174 | INTERFACE ASSEMBLY |
| 13 | 186-032012382 | ROLLER |
| 14 | 186-031031061 | TRANSPORT BELT |
| 15 | 186-032011702 | TIMING PULLEY |
| 16 | 186-031033011 | TIMING BELT |
| 17 | 186-032022112 | RIGHT PLATE |
| 18 | 186-032022113 | LEFT PLATE |
| 19 | 186-034002556 | TRANSPORT ROLLER |
| 20 | 600A-18459 | GUIDE STRIP |
| 21 | 600B-17436-004 | LABEL |
| 22 | 002B-16373 | SENSOR ROD ASSEMBLY |
| 23 | 320-27400-600 | MOUNT BLOCK |
| 24 | 014-10221106 | SHCS,#10-32 X .375 |
| 25 | 057-27830-500 | SENSOR ASSEMBLY |
| 26 | 014-04041110 | BHSCS,#4-40 X .625 |
| 27 | 095-24260-600 | SENSOR MOUNT SHAFT |
| 28 | 014-06251104 | SHSS,#6-32 X .25 |
| 29 | 014-02600008 | PHMS,#2-56 X .50 |
| 30 | 007-27399-600 | BRACKET |
| 31 | 014-08251106 | SHSS,#8-32 X .375 |
| 32 | 600B-16891 | SLIDE |
| 33 | 186-034002476 | HOLDDOWN ASSEMBLY |
| 34 | 186-031027387 | GUIDE STRIP |
| 35 | 186-034003980 | ROLLER |
| 36 | 600A-23301 | STEEL ROLLER |
| 37 | 186-032012468 | WEIGHT |
| 38 | 186-031027342 | RED C-CLIP |

**563-27650-500, FOLD
PLATE 1**



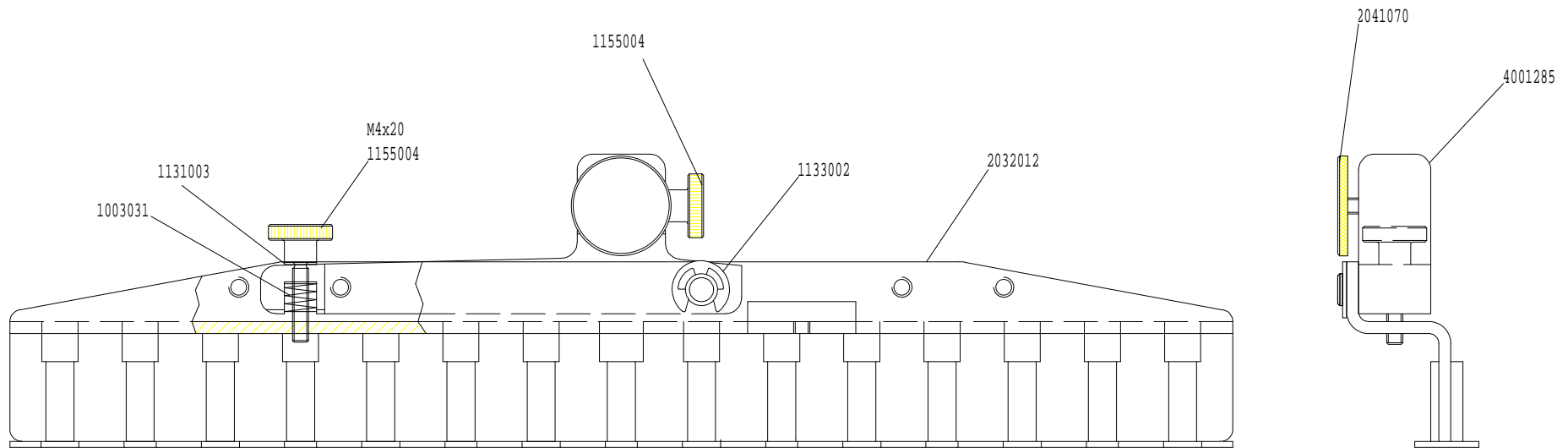
563-27650-500, FOLD PLATE 1

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|----------------------------|
| 1 | 007-24247-600 | LEFT SENSOR BRACKET |
| 2 | 007-24248-600 | RIGHT SENSOR BRACKET |
| 3 | 014-24283 | SHOULDER SCREW |
| 4 | 095-24260-600 | SENSOR BAR |
| 5 | 057-27830-500 | GLUE SENSOR |
| 6 | 186-034004810 | FOLD PLATE,"C" FOLD |
| 7 | 503-24261-600 | PIVOT ARM |
| 8 | 516-24253-600 | RIGHT MOUNTING BLOCK |
| 9 | 516-24254-600 | LEFT MOUNTING BLOCK |
| 10 | 516-24259-600 | MOUNTING BLOCK |
| 11 | 584-24251-600 | RIGHT MOUNTING PLATE |
| 12 | 584-24252-600 | LEFT MOUNTING PLATE |
| 13 | 586-24284 | PLUNGER,RETRACTABLE SPRING |
| 14 | 007-27774-600 | SENSOR BRACKET |

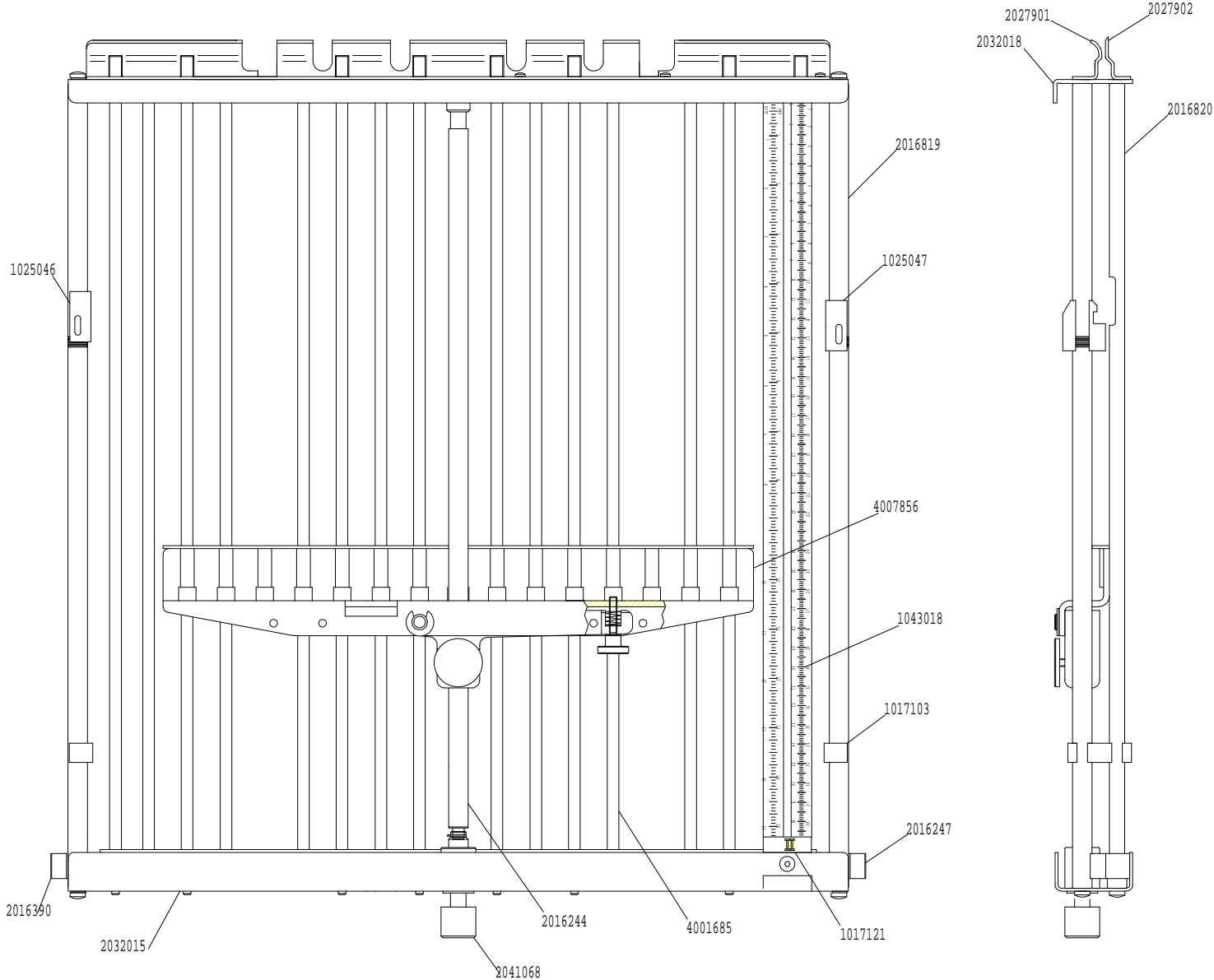
563-27998-500, FOLD PLATE 1, Z FOLD OPTION

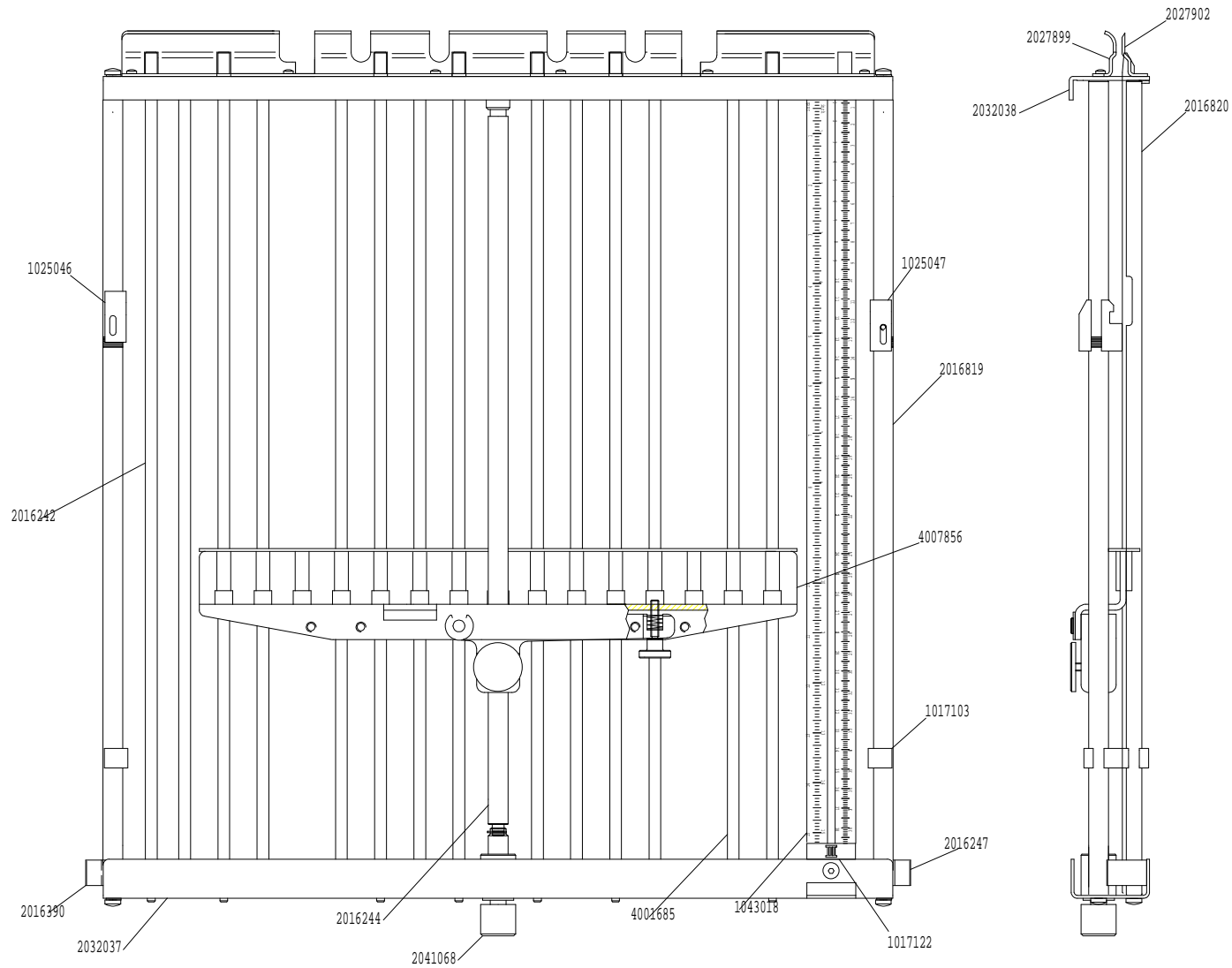
563-27998-500, FOLD PLATE 1, Z FOLD OPTION

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|----------------------|
| 1 | 007-24250-600 | GUN MOUNTING BRACKET |
| 2 | 007-24255-600 | MOUNTING BRACKET |
| 3 | 095-24260-600 | SENSOR MOUNTING BAR |
| 4 | 057-27830-500 | GLUE SENSOR |
| 5 | 584-24256-600 | MOUNTING PLATE |
| 6 | 584-24257-600 | MOUNTING PLATE |

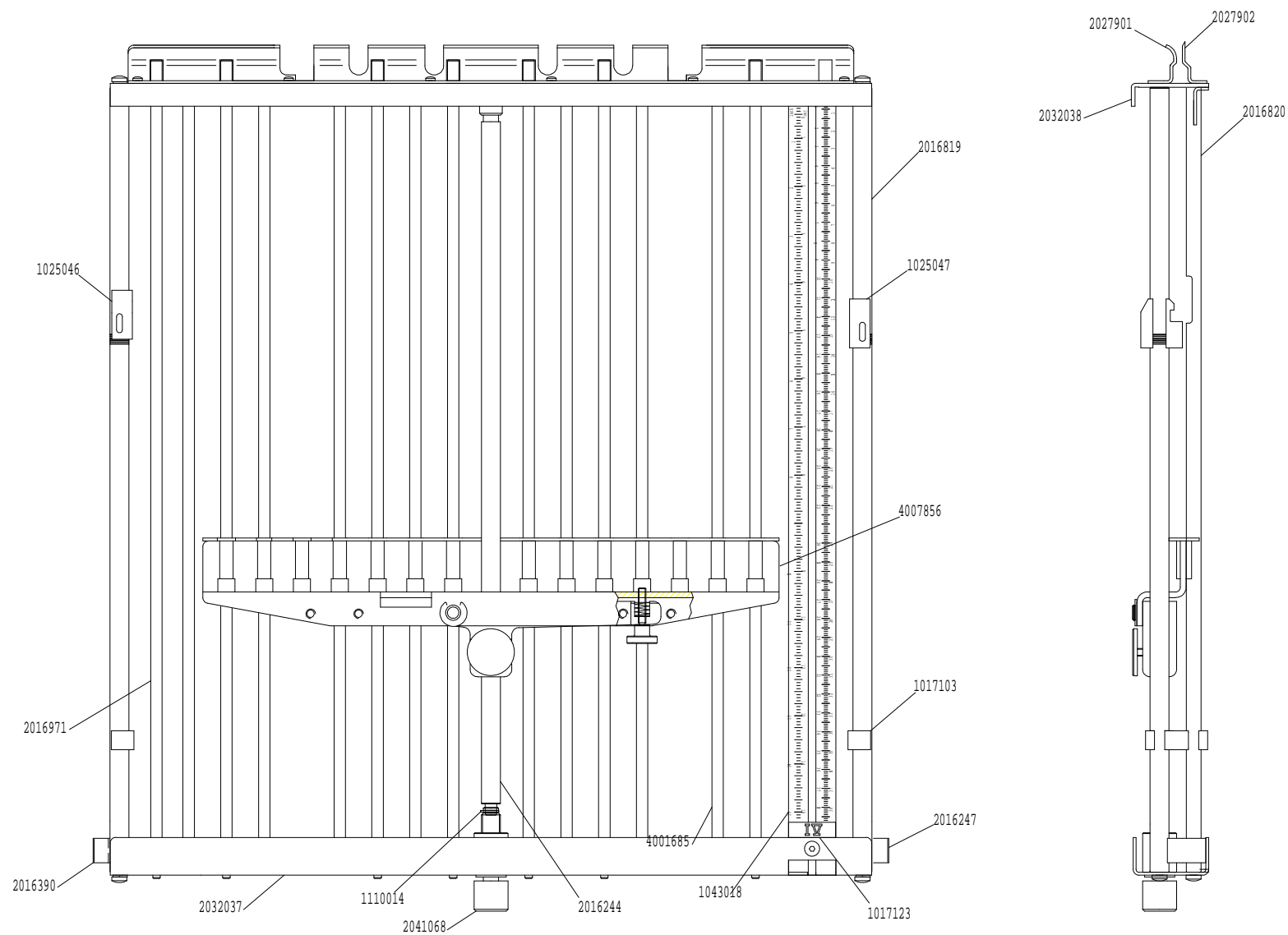
186-034007856, PAPER STOP, FOLD PLATE

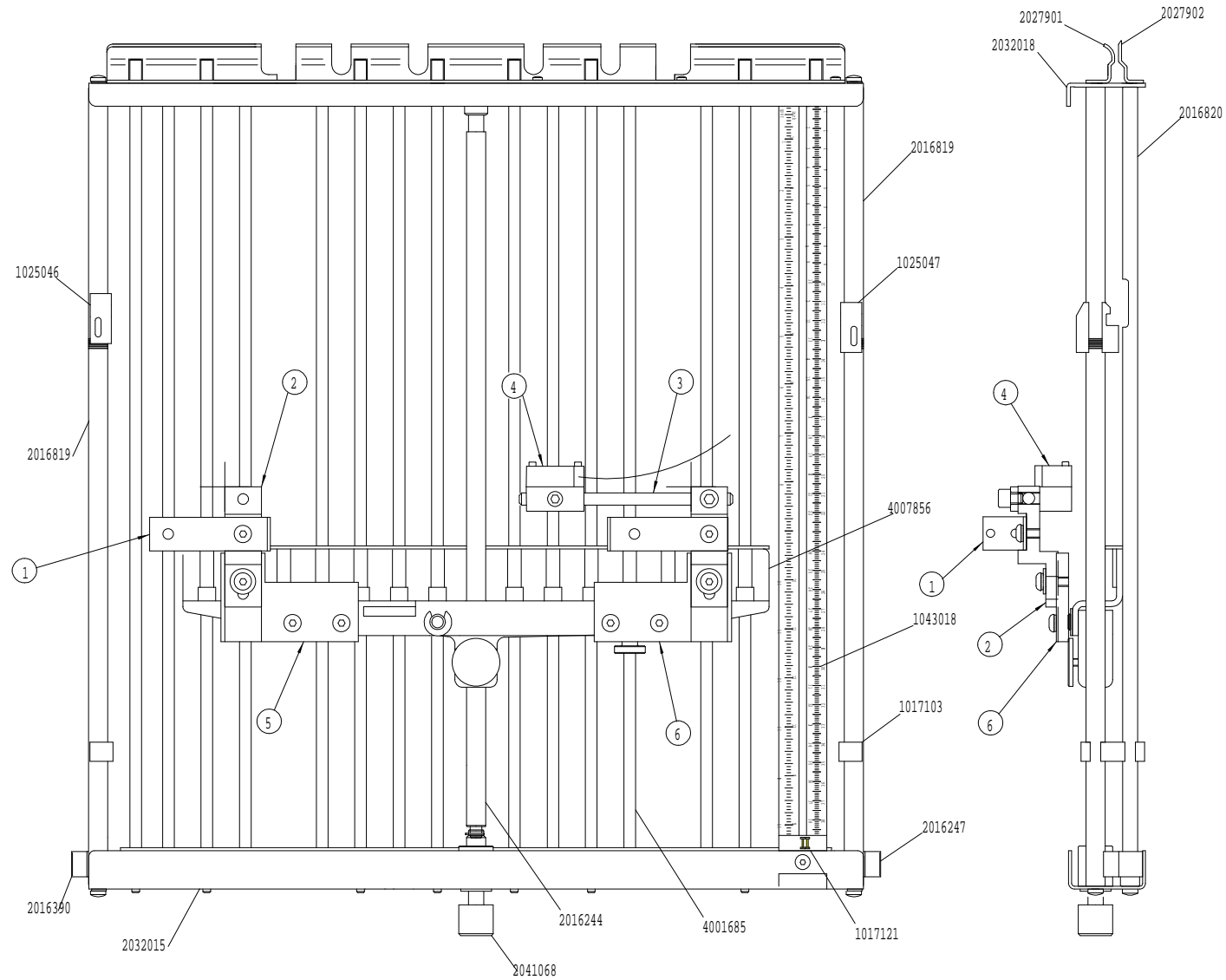
186-034004811, FOLD PLATE 2



186-034004812, FOLD PLATE 3

186-034004813, FOLD PLATE 4

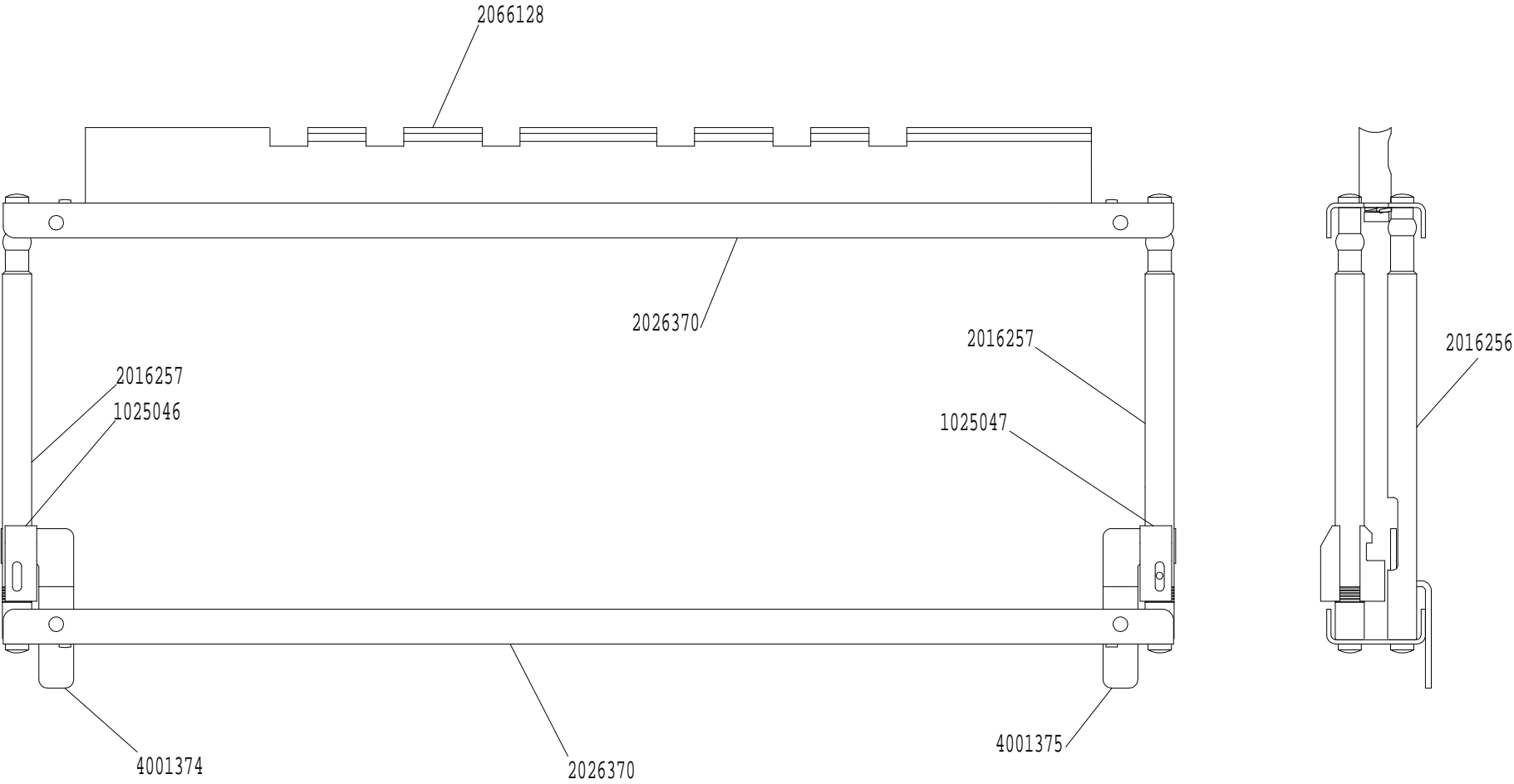


563-27999-500, FOLD PLATE 4, Z FOLD OPTION

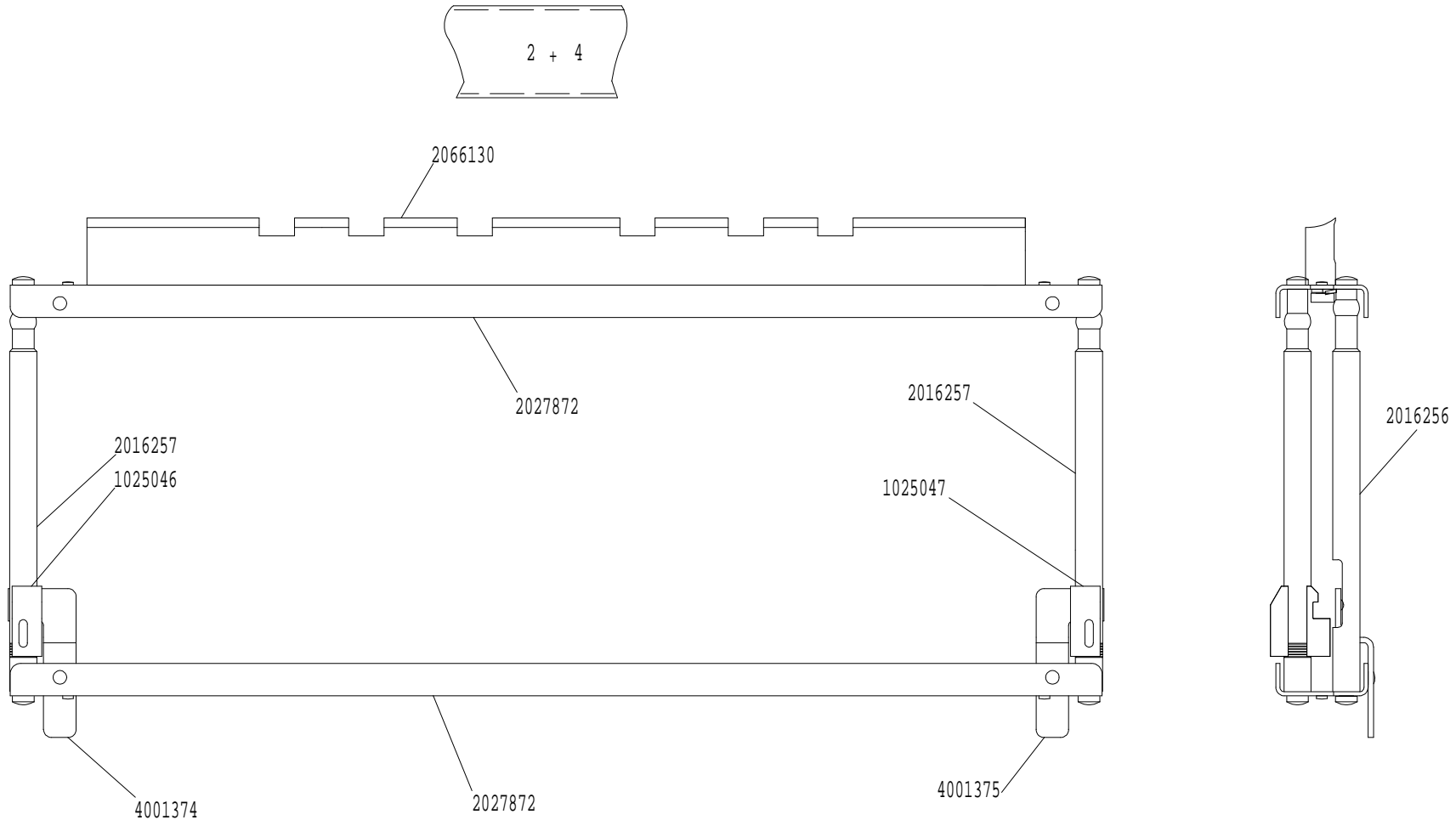
563-27999-500, FOLD PLATE 4, Z FOLD OPTION

| INDEX | PART NUMBER | DESCRIPTION |
|-------|----------------|----------------------|
| 1 | 007-24250-600 | GUN MOUNTING BRACKET |
| 2 | 007-24255-600 | MOUNTING BRACKET |
| 3 | 095-24260-600 | SENSOR MOUNTING BAR |
| 4 | 186-5412A11211 | SENSOR |
| 5 | 584-24256-600 | MOUNTING PLATE |
| 6 | 584-24257-600 | MOUNTING PLATE |

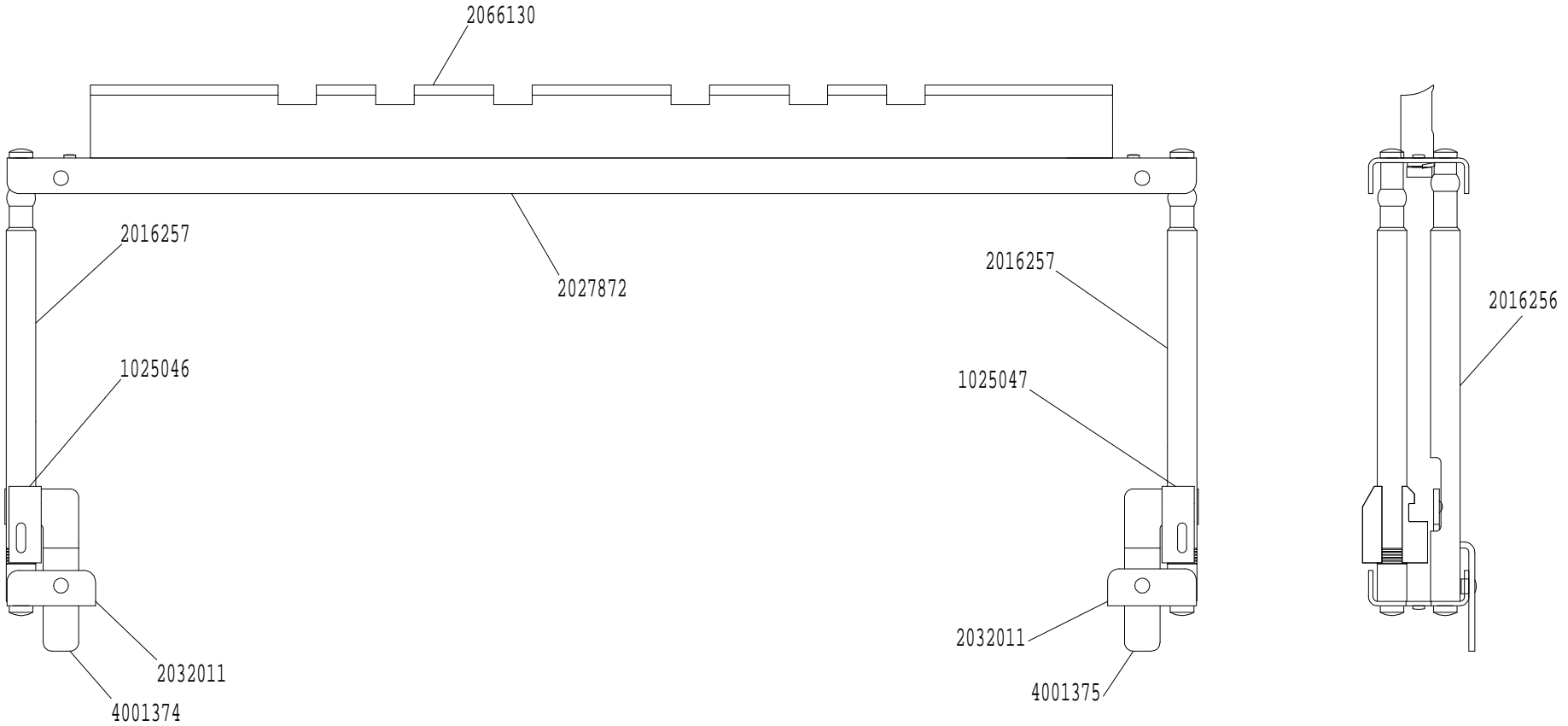
186-034004814, BYPASS PLATE 1 & 3

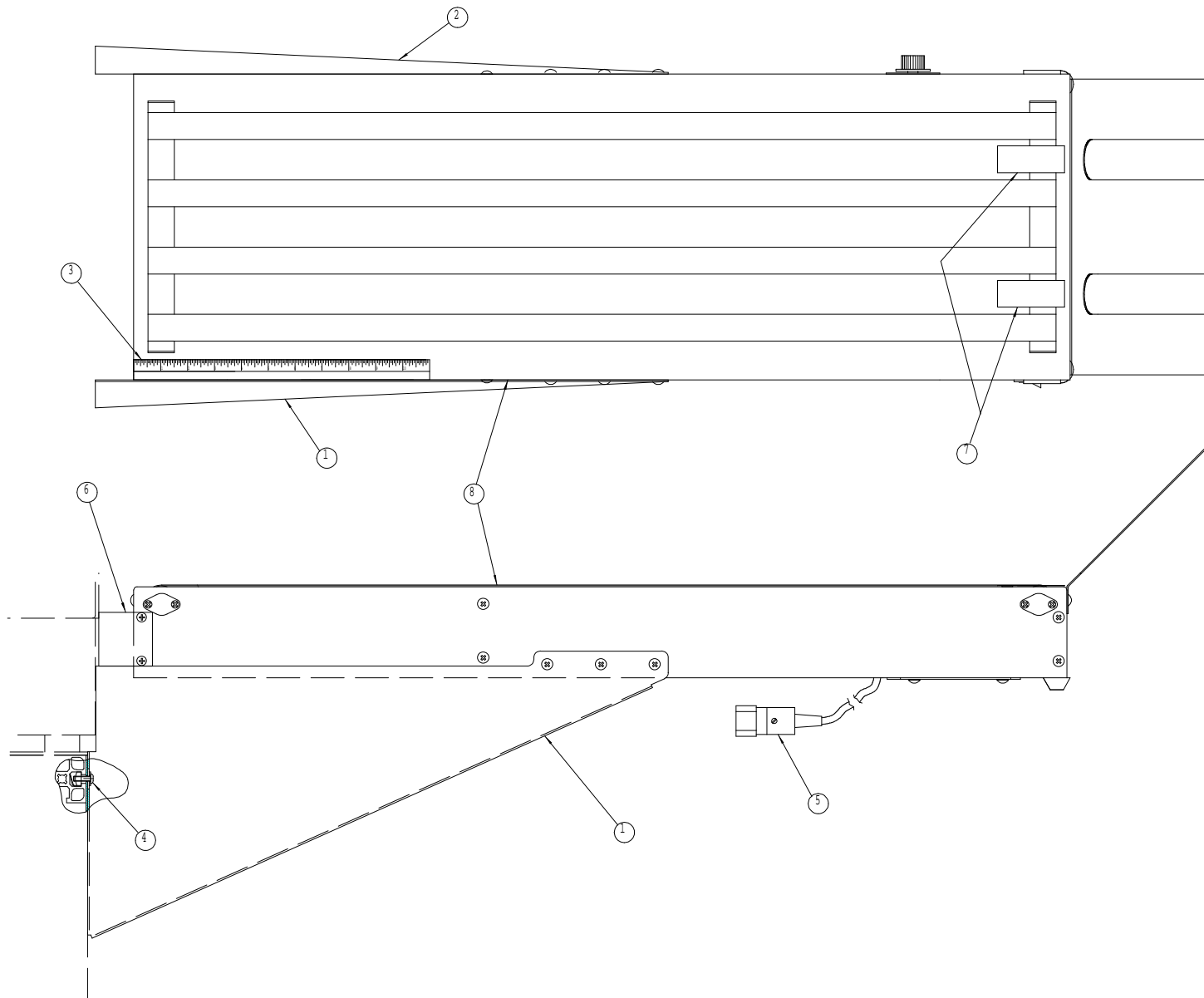


186-034004815, BYPASS PLATE 2 & 4



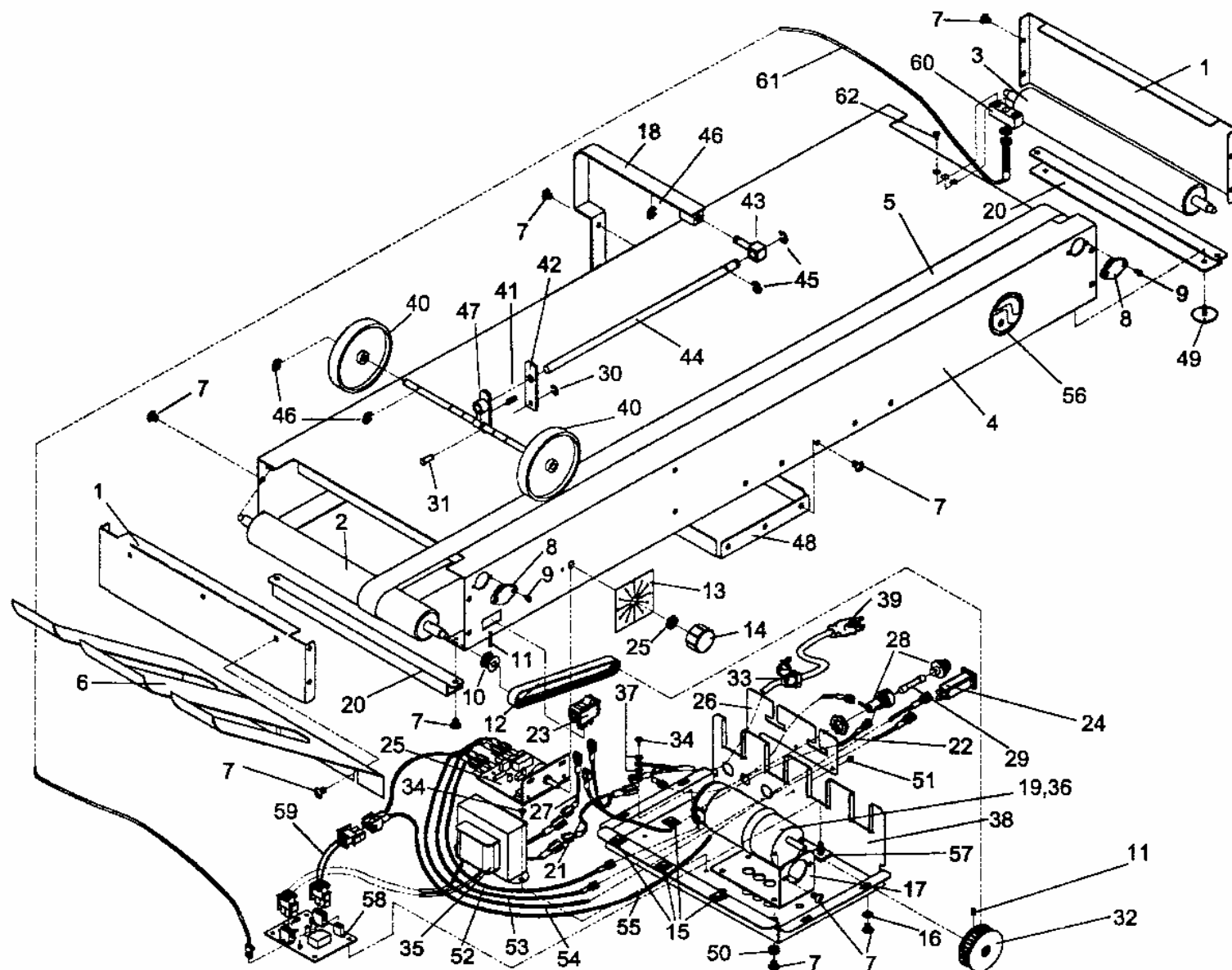
186-034007855, BYPASS PLATE 2 & 4, Z FOLD





750-27291-500, EXIT CONVEYOR, page 1

| INDEX | PART NUMBER | DESCRIPTION |
|-------|---------------|------------------------|
| 1 | 007-27384-600 | RIGHT BRACKET |
| 2 | 007-27385-600 | LEFT BRACKET |
| 3 | 010-24286 | RULE LABEL |
| 4 | 014-M05003016 | PHILLIPS SCREW,M5 X 16 |
| 5 | 035-83011080 | PLUG |
| 6 | 600A-18745 | S.C. BRACKET |
| 7 | 600A-18855 | EXIT GUIDE STRIP |
| 8 | 750-27251-000 | EXIT CONVEYOR, ASTRO |



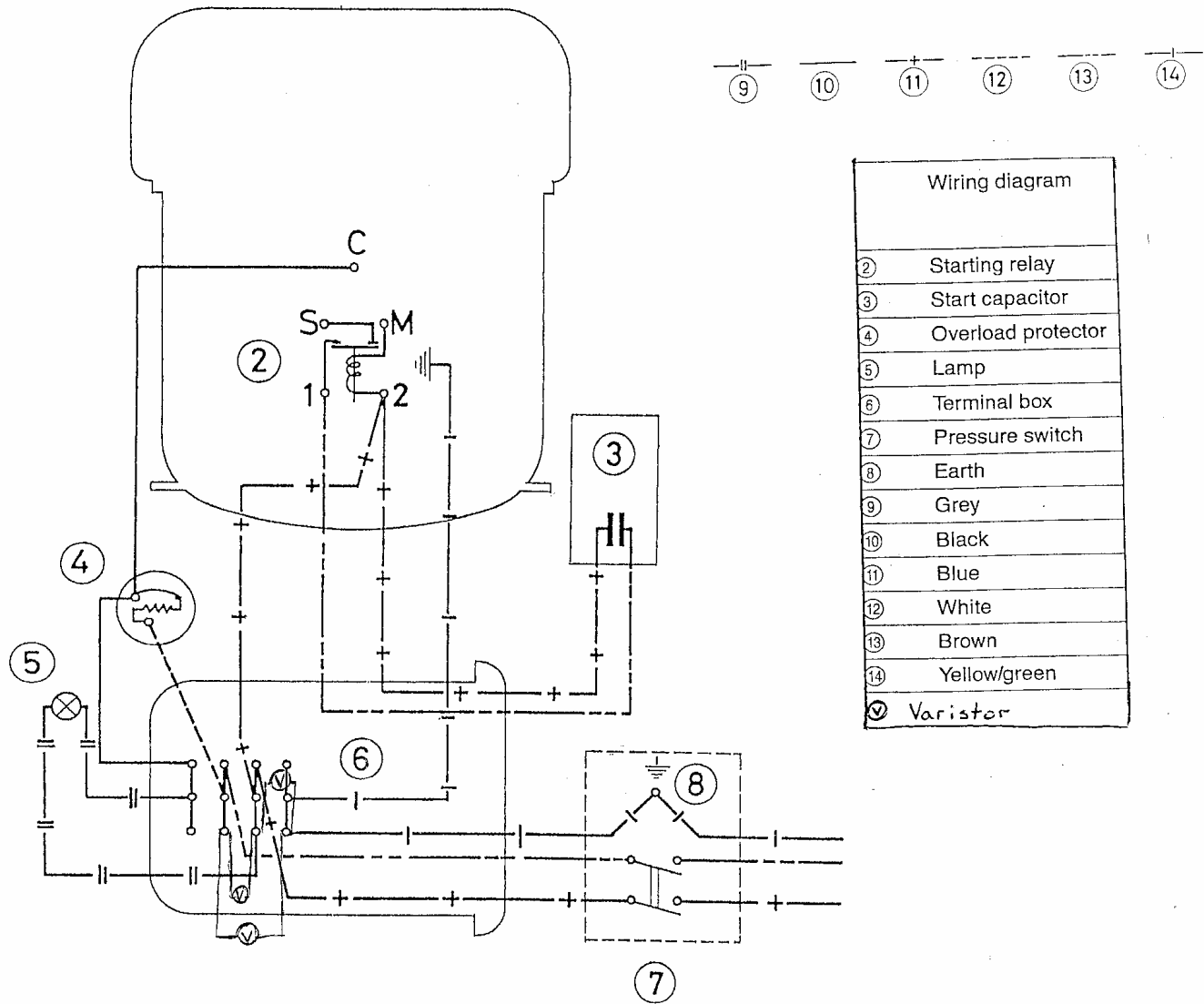
750-27251-000, EXIT CONVEYOR, page 2

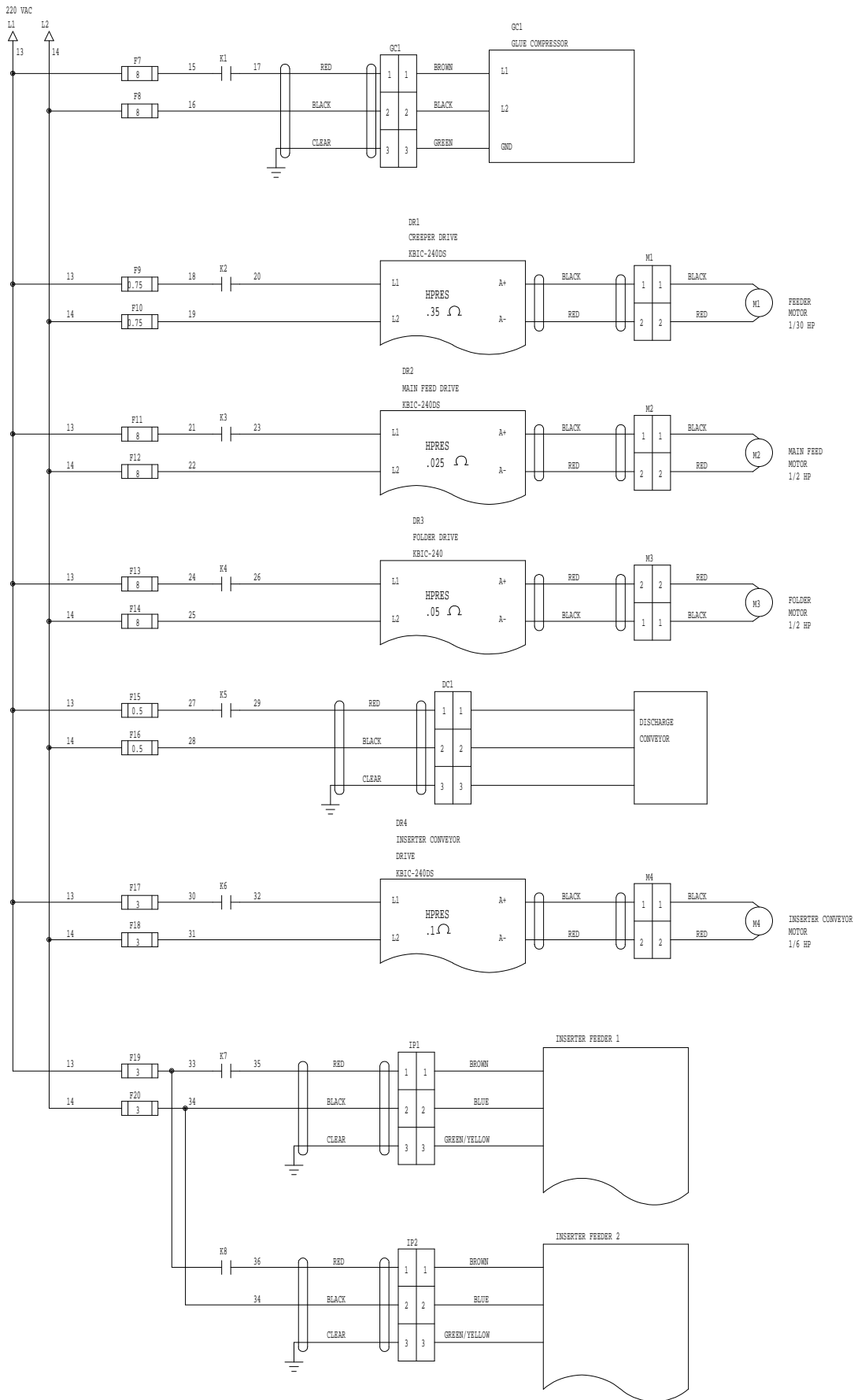
| INDEX | PART NUMBER | DESCRIPTION |
|-------|----------------|-----------------------------|
| 1 | 186-37CD40006A | BODY CLOSURE |
| 2 | 186-375050040A | DRIVE ROLLER |
| 3 | 186-375050041 | IDLER ROLLER |
| 4 | 186-37CD40003A | CONVEYOR BODY |
| 5 | 186-371230309 | CONVEYOR TAPE |
| 6 | 186-37CD30017A | RECEIVING TRAY |
| 7 | 186-371230017 | SCREW,#10-32 X ¼" |
| 8 | 186-379010352 | BEARING HOUSING ASSEMBLY |
| 9 | 186-371230275 | SCREW,#6-32 X ¼" |
| 10 | 186-371230102 | PULLEY |
| 11 | 186-371230036 | ROLL PIN |
| 12 | 186-371230139 | TIMING BELT,100XL032 |
| 13 | 186-379010511 | DECAL, SENSOR SWITCH INDIC. |
| 14 | 186-371231101 | KNOB |
| 15 | 186-371230945 | CABLE TIE MOUNT |
| 16 | 186-371230237 | STAR WASHER,#10 |
| 17 | 186-37CD401106 | MOTOR BRACKET |
| 18 | 186-37CD30014 | BAIL WELDMENTQ |
| 19 | 186-371230924 | GEAR MOTOR,24V |
| 20 | 186-37CD30130 | CONVEYOR SUPPORT |
| 21 | 186-37CD50005 | WIRE HARNESS,SWITCH – TRANS |
| 22 | 186-37CD50006 | WIRE HARNESS,SWITCH – FUSE |
| 23 | 186-371230664 | POWER SWITCH |
| 24 | 186-371231104 | CIRCUIT BREAKER |
| 25 | 186-37CD401113 | SPEED CONTROL ASSEMBLY |
| 26 | 186-37CDR0125 | COVER |
| 27 | 186-37CD50001 | WIRE HARNESS,SWITCH – TRANS |
| 28 | 186-371230089 | FUSE HOLDER |
| 29 | 186-371230680 | FUSE,.5A,250V (115V,60Hz) |
| | 186-371231179 | FUSE,.3A,250V (220V,50HZ) |
| 30 | 186-371230080 | C-CLIP,3/16" |
| 31 | 186-37CD30061 | PIN |
| 32 | 186-375710078 | MOTOR PULLEY,28T |
| 33 | 186-371230301 | STRAIN RELIEF |
| 34 | 186-371230125 | SCREW,#8-32 X .187 |
| 35 | 186-375750002 | TRANSFORMER (115V,60Hz) |
| | 186-375750016 | TRANSFORMER (220V,50Hz) |

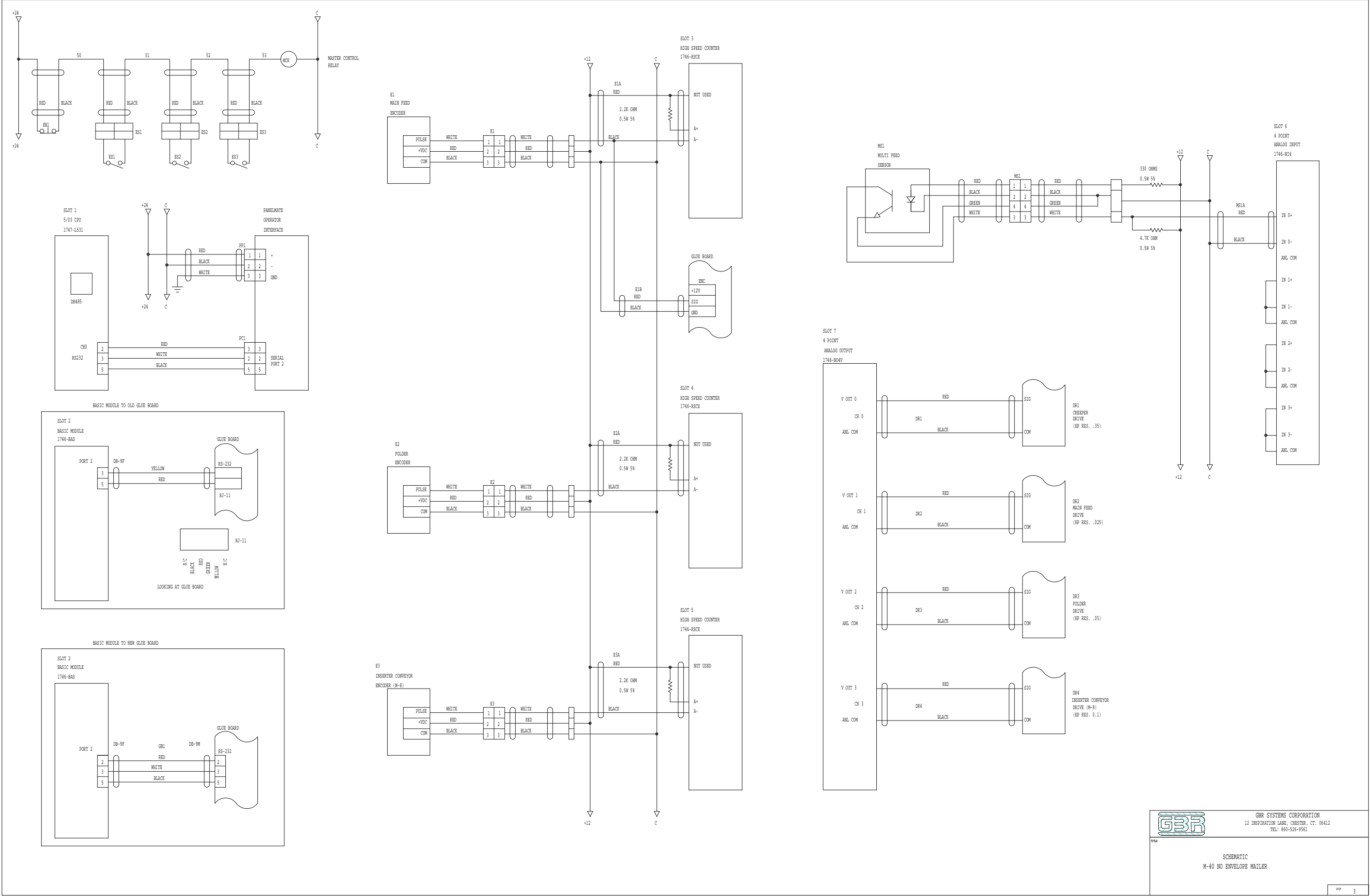
| | | |
|----|----------------|--------------------------------|
| 36 | 186-37CD401107 | MOTOR ASSEMBLY |
| 37 | 186-371230252 | STAR WASHER,#6 |
| 38 | 186-37CD401105 | ELECTRIC CABINET |
| 39 | 186-37CD30025 | POWER CORD |
| 40 | 186-37CD30021 | STACKING WHEEL |
| 41 | 186-377112009 | SPRING |
| 42 | 186-37CD30059 | CLAMP PLATE |
| 43 | 186-37CD30013 | PIVOT,STACKING WHEEL ROD |
| 44 | 186-37CD30011 | ROD,STACKER WHEEL |
| 45 | 186-371230432 | C-CLIP,5/16" |
| 46 | 186-371230081 | C-CLIP,1/4" |
| 47 | 186-375050056 | STACKER WHEEL PIVOT ASM |
| 48 | 186-37CD40009 | CENTER SUPPORT |
| 49 | 186-371230620 | FOOT (table-top model only) |
| 50 | 186-371230916 | GROMMET,3/16"X 7/16" |
| 51 | 186-371230461 | SCREW,#6-32 X 3/16" |
| 52 | 186-37CD50004 | WIRE HARNESS,SPEED CNTL-MTR |
| 53 | 186-37CD50007 | WIRE HARNESS,SPEED CNTL-MTR |
| 54 | 186-37CD50002 | WIRE HARNESS,SPEED CNTL-FUSE |
| 55 | 186-37CD50003 | WIRE HARNESS,FUSE-SPEED CNTL |
| 56 | 186-371230752 | DECAL,2" ASTRO LOGO |
| 57 | 186-371231286 | MOUNT SPACER |
| 58 | 186-37CD401115 | PHOTOSENSOR INTERFACE BOARD |
| 59 | 186-37CD50008 | WIRE HARNESS,FUSE-SPD CNTL BD |
| 60 | 186-37CD30009 | SENSOR BRACKET |
| 61 | 186-37CD30150 | PHOTOSENSOR ASSEMBLY |
| 62 | 186-371230683 | SCREW,#6-32 X 5/16"PH UNDERCUT |

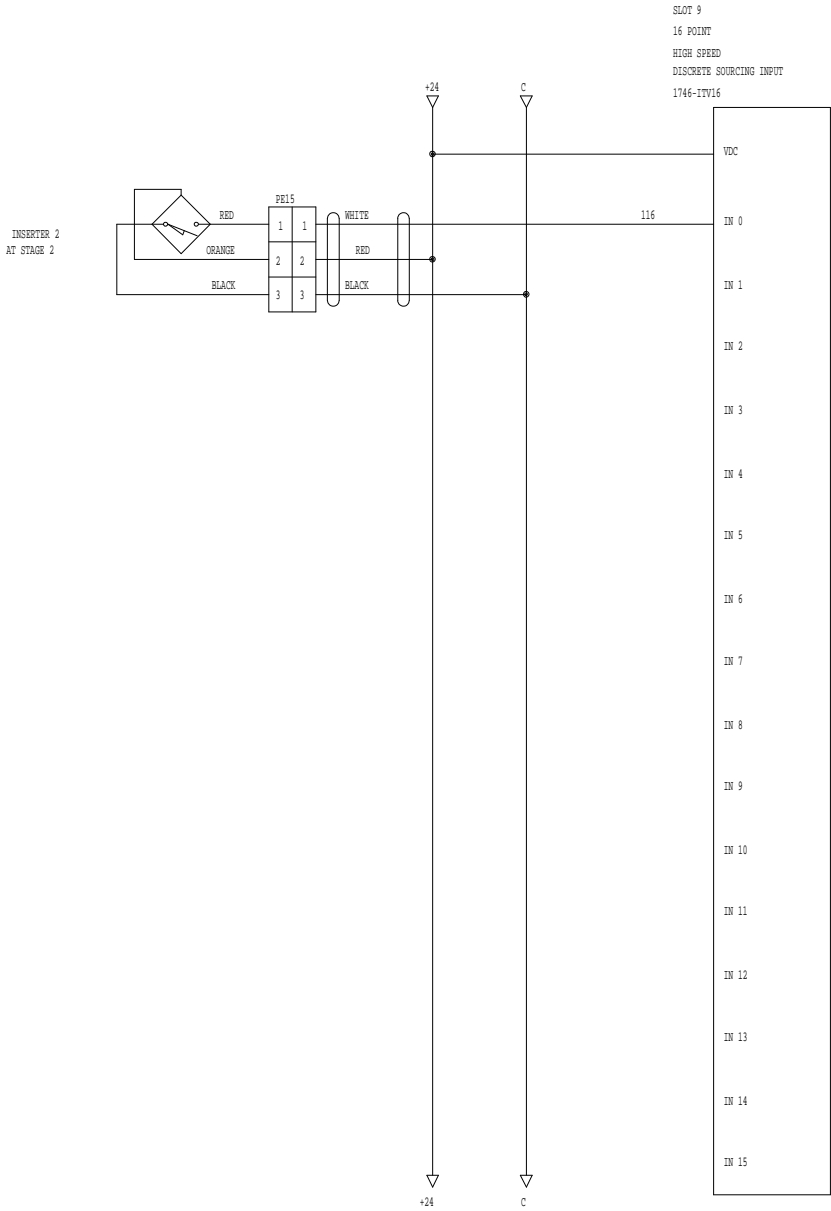
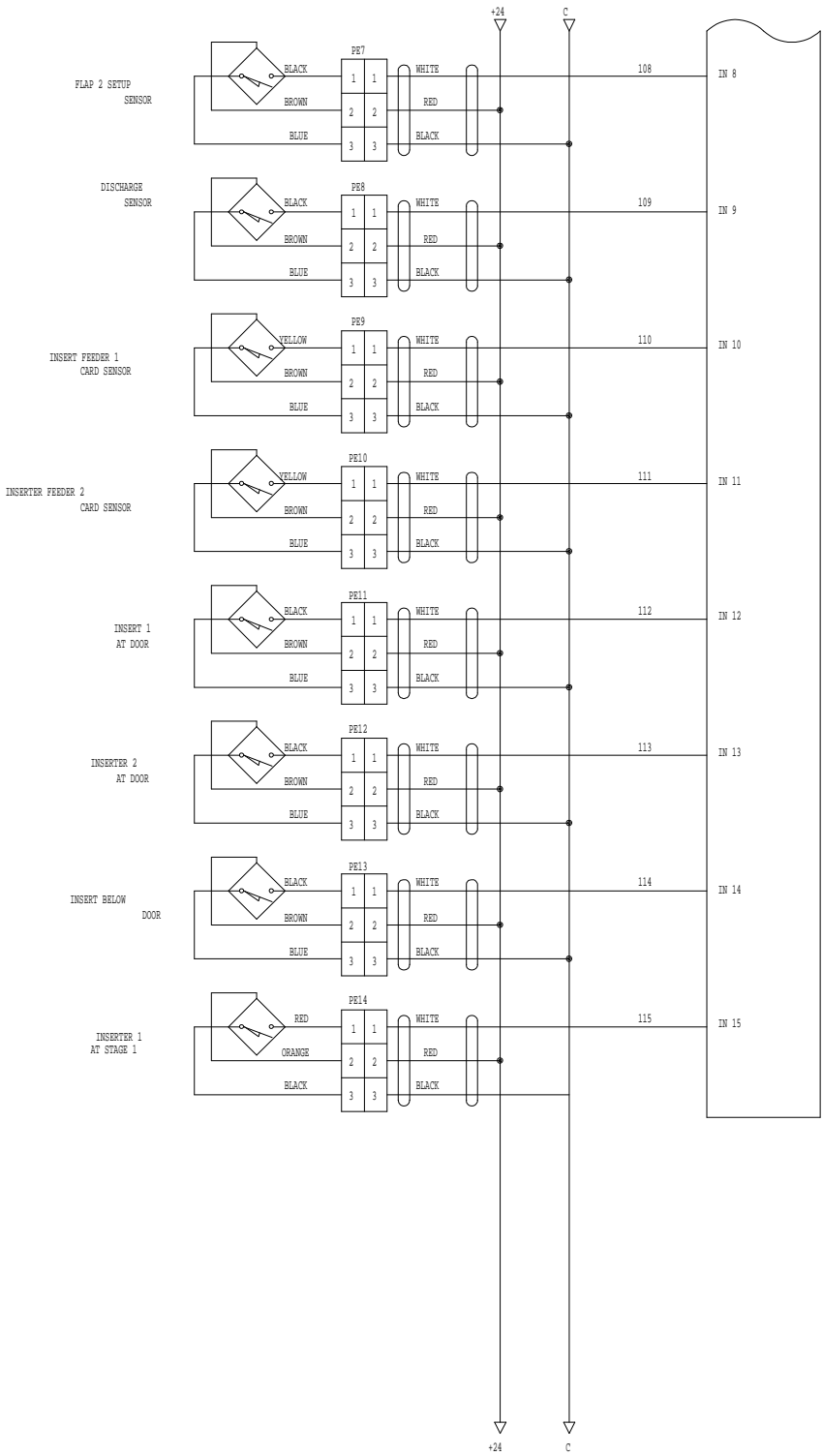
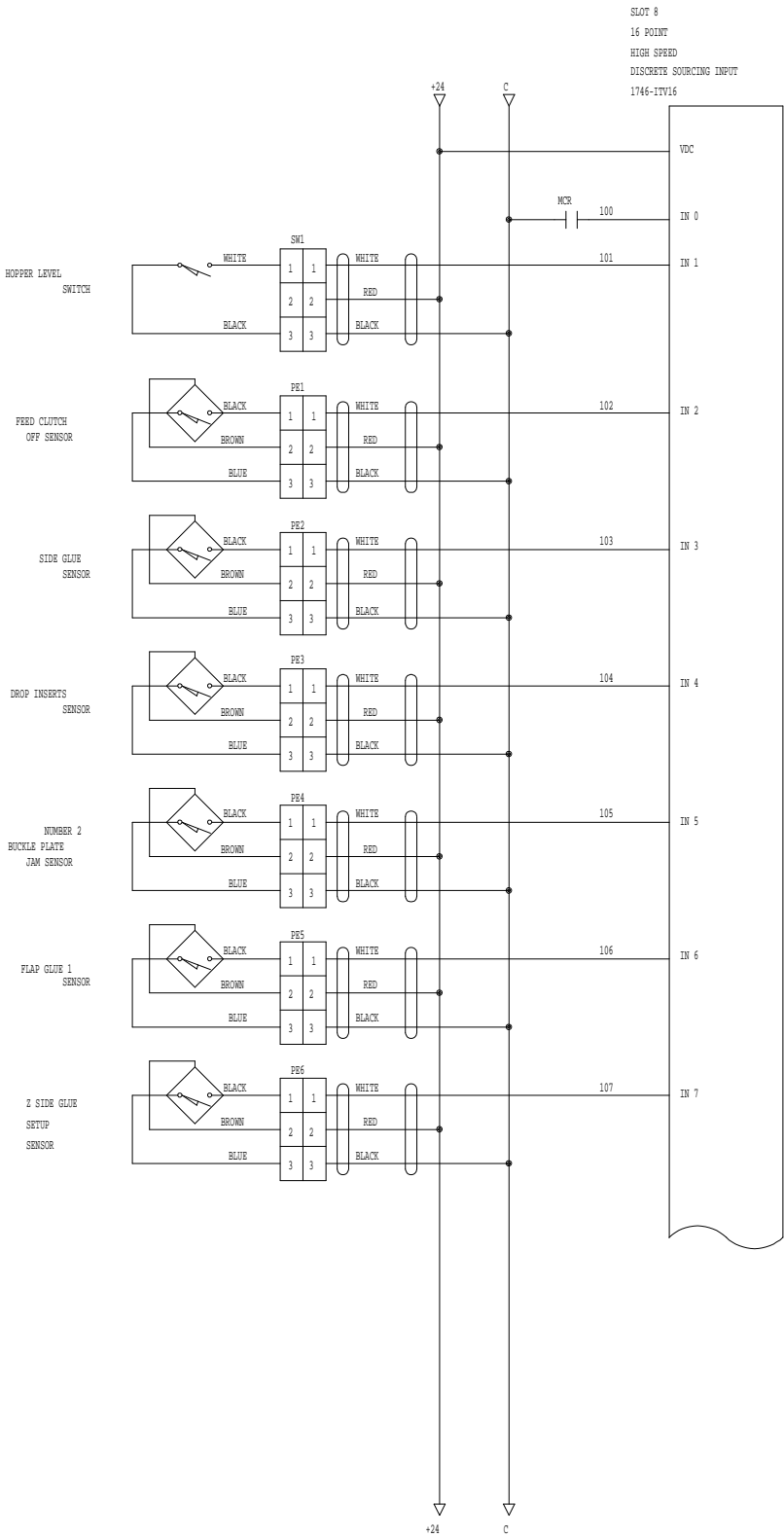
SECTION H SCHEMATICS

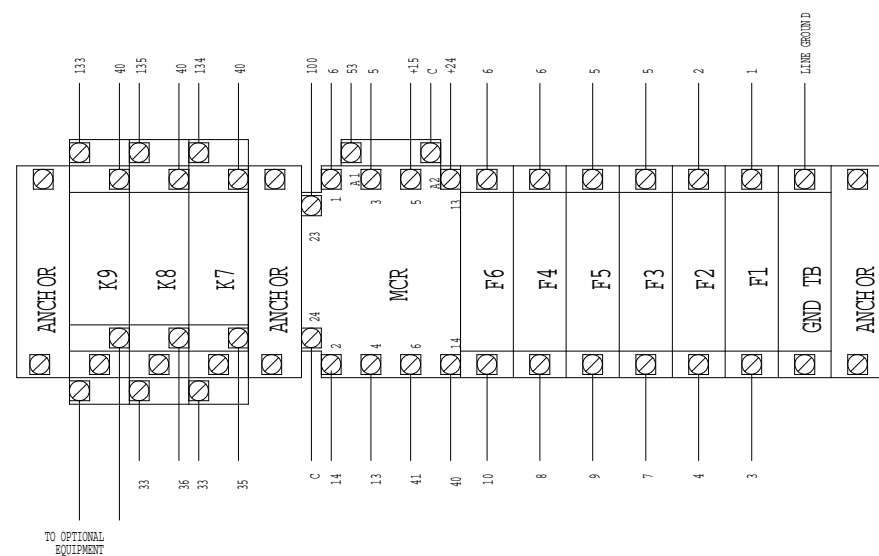
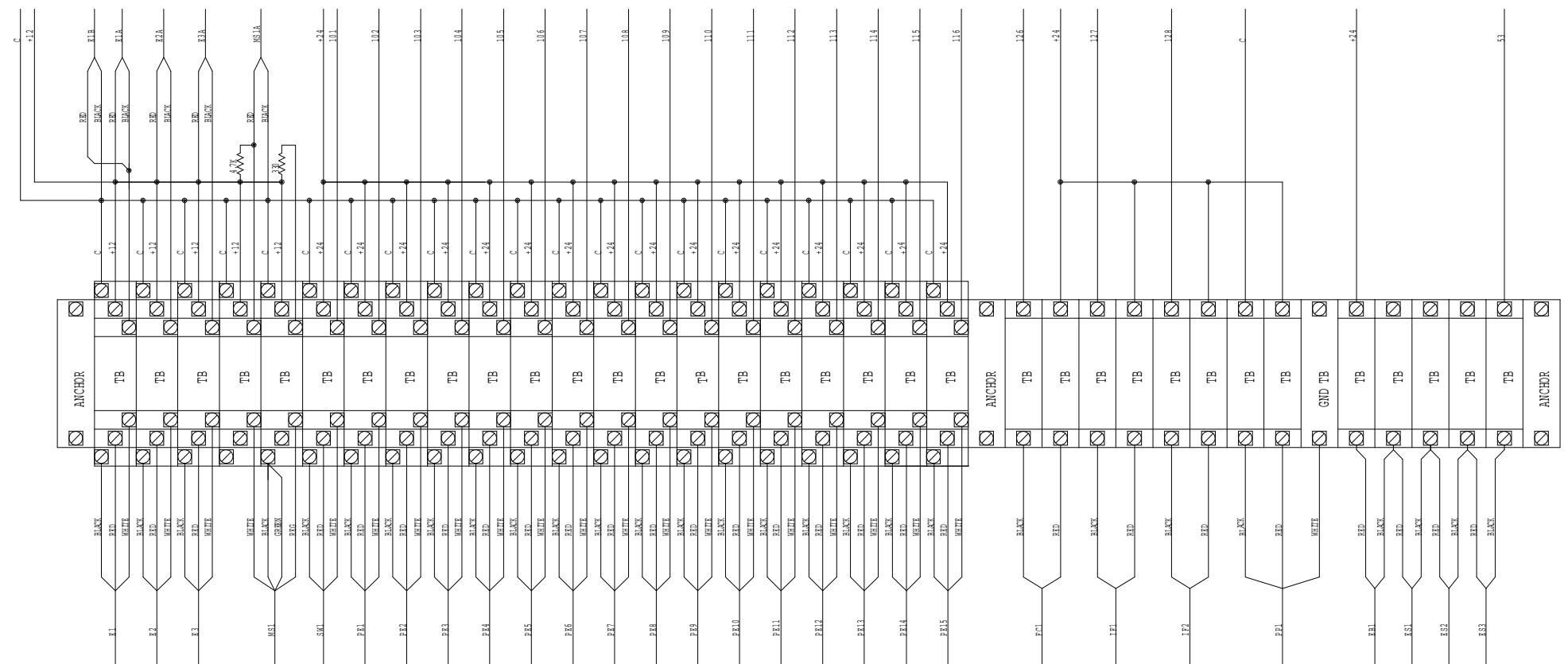
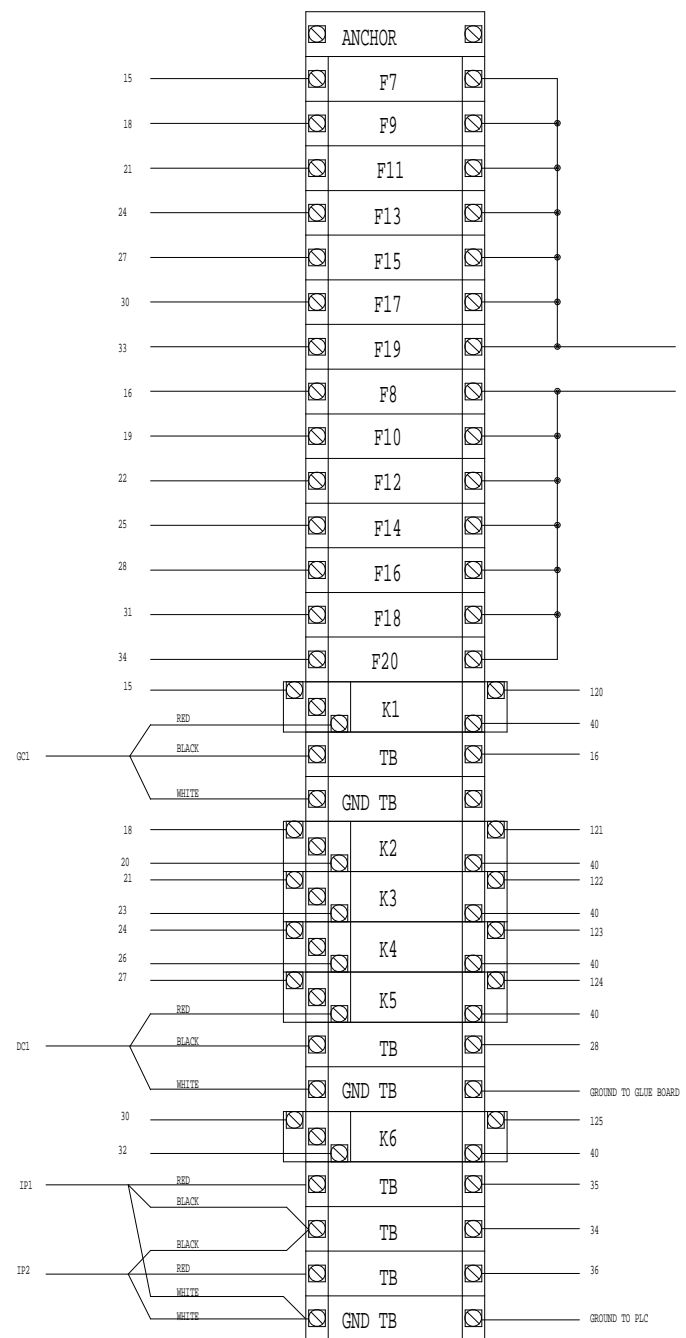
| Schematic | Page |
|-------------------------|------|
| Compressor schematic | 1 |
| OS-20 Machine schematic | 2 |

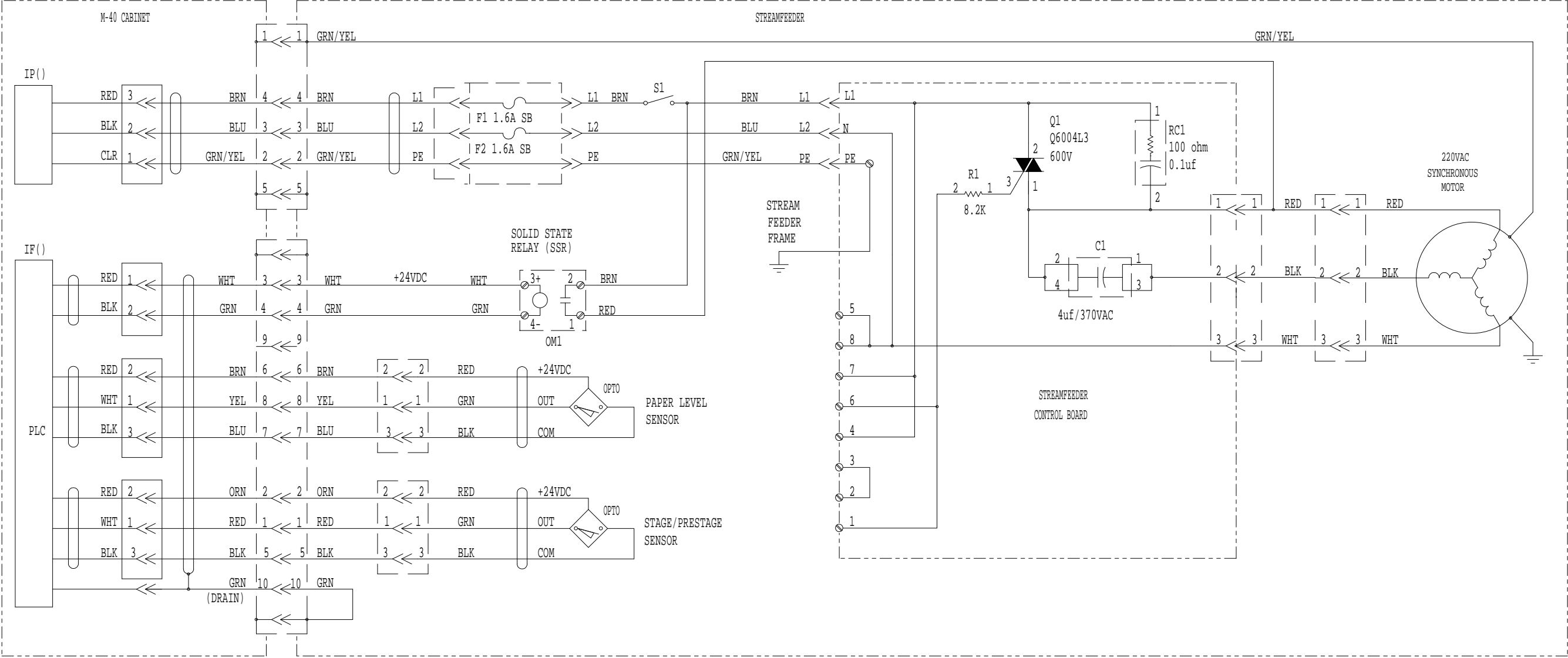












STREAMFEEDER RELIANT 1500, 220V
ELECTRICAL MODIFICATIONS SCHEMATIC

549-27444-300

SECTION I FACTORS TO CONSIDER WHEN SELECTING PAPER

| | | | |
|--|----------|---|----------|
| I.1 PRICE VS COST EFFECTIVENESS..... | 2 | I.6 POROSITY..... | 4 |
| I.2 MOISTURE CONTENT..... | 2 | I.7 PAPER CURL..... | 4 |
| I.2a Correct Moisture Content..... | 2 | I.8 CONTROLLING HUMIDITY..... | 4 |
| I.2b Storage..... | 2 | I.8a Mailroom Environment..... | 4 |
| I.2c Moisture & Curl | 2 | I.8b Adjusting Relative Humidity (RH)..... | 4 |
| I.2d Trial Run | 2 | I.8c Measuring Humidity | 5 |
| I.2e Wire and Felt Side | 2 | I.8d External Overloading | 5 |
| I.3 STIFFNESS | 3 | I.9 PAPER STORAGE | 5 |
| I.3a The Rigidity or Bending Resistance of Paper..... | 3 | I.10 PAPER SPECIFICATIONS | 5 |
| I.4 Paper Grain..... | 3 | | |
| I.5 OPACITY | 4 | | |

GENERAL GUIDELINES AND INFORMATION

IMPORTANT NOTE: ALTHOUGH GBR IS WILLING TO ASSIST CUSTOMERS IN THE DEVELOPMENT OF CRITERIA FOR THE SPECIFICATION OF PAPER AND FORMS SUPPLIES IN PARTICULAR APPLICATIONS, THE RESPONSIBILITY FOR FINAL SELECTION RESTS WITH OUR CUSTOMERS.

I.1 PRICE VS COST EFFECTIVENESS

Paper prices for the same type paper will vary considerably. To get the most productivity from printing and mailing equipment select papers for their “Runability”, causing fewer jams and less down time, while maintaining quality throughput. Low cost paper that does not run smoothly can cost more in lost production than it saves in paper cost.

Always run the machine to test any new paper before purchasing a large quantity.

I.2 MOISTURE CONTENT

Moisture content in paper directly affects paper processing quality. High moisture content causes excessive curl and jamming problems. Low moisture content causes static leading to misfeed paper and jams.

I.2a Correct Moisture Content

Paper with moisture content between 4-6% will minimize problems. Moisture content should be uniform throughout a ream, box or roll.

Porosity can also affect moisture problems in paper. Paper that is very porous absorbs moisture quickly. Low porosity paper resists moisture absorption.

I.2b Storage

Stored paper should not lose or gain moisture during storage (refer to the “PROPER PAPER STORAGE” section of this document for guidelines on paper storage and handling).

I.2c Moisture & Curl

Paper with moisture content above 6% can cause excess curl during printing. Paper that produces a minimum amount of curl runs better in printing and mailing equipment.

I.2d Trial Run

Before purchasing any new type paper in quantity, our customers should make a trial run with the paper, to test for curl, jamming and other running problems.

I.2e Wire and Felt Side

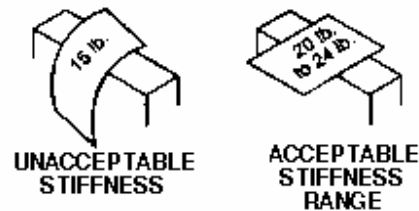
The paper's wire side (rougher side) was in contact with a wire screen during the manufacturing processes.

The felt side (normal curl direction) faced up or away from the wire screen during paper manufacturing. The felt side contains more sizing and filler and is smoother than the wire side.

I.3 STIFFNESS

I.3a The Rigidity or Bending Resistance of Paper

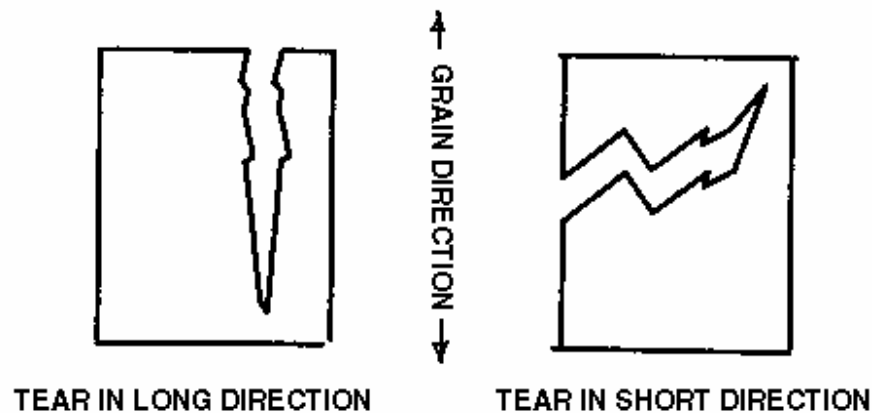
A general guideline for stiffness of paper used in mail handling equipment is a good grade of copier or bond paper between 20 and 24 pounds.



I.4 Paper Grain

The Direction in Which Most of the Paper Fibers Lie

There are two quick field tests that can be used to determine a paper's grain direction:



Tear Showing Grain

Tear Test

Tear the paper in question lengthwise and then tear it across the short side

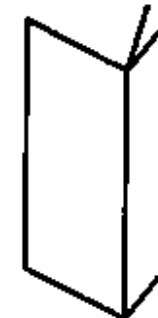
Paper always tears straighter in the direction of the grain.

Fold Test

Test fold the paper in question the long way and then fold it the short way

Paper tends to fold straight and evenly in the direction of the grain and it folds roughly with cracks in the cross grain direction.

FOLD IS STRAIGHT
AND EVEN



FOLD IN GRAIN
DIRECTION

FOLD LINE IS
ROUGH AND
CRACKED



FOLD IN CROSS GRAIN
DIRECTION

I.5 OPACITY

Degree of show-through of print on a sheet, from the backside or from one sheet to another. High opacity paper is difficult to see through.

GBR Systems often includes electronic OMR and 3 of 9 Barcode Reading. The paper used in these applications should be opaque enough to prevent OMR and Barcode read through from one sheet to another.

I.6 POROSITY

Paper porosity is an important factor in printing and mail-handling applications. Too porous a paper can cause double feeding and misfeeds. High porosity (less dense) papers tend to have more curl and cause imaging problems in laser printers.

I.7 PAPER CURL

Paper with a low curl factor can make a positive difference in printing and mailing system productivity.

Short Curl Direction

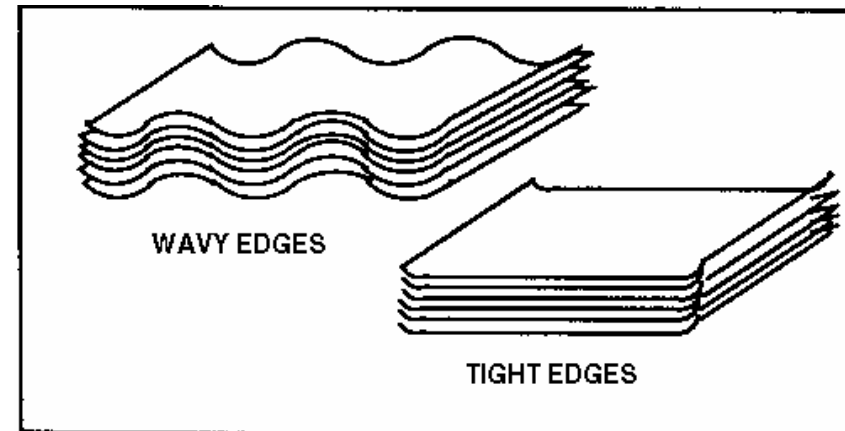
The short edges of the sheets curl toward or away from the imaged side.

I.8 CONTROLLING HUMIDITY

Dramatic changes in operating performance in the mailroom could occur when marginal moisture related conditions exist. If paper moisture content is close to jamming levels, slight changes in relative humidity can change paper performance: sometimes for the better and other times it gets worse.

Too much humidity can cause wavy edges during printing and too little humidity can cause tight edges. See illustration.

Paper that is too porous (less than 20 Gurley seconds) will absorb moisture quickly. This can increase the wavy edge problem. Paper in the range of 10 Gurley seconds (porosity rating) will tend to cause this type of problem.



I.8a Mailroom Environment

For Optimum Mailroom conditions the recommended operating range is:

Temperature 64 - 90° F (18 - 30° C)

Humidity 40 - 60%(non-condensing)

The symptoms of wavy edges (High Moisture Environment) and tight edges (Low Moisture Environment) could indicate the corrective direction of Relative Humidity (RH) adjustment that must be taken.

I.8b Adjusting Relative Humidity (RH)

The RH operating environment should be adjusted no more than 5 - 15% up or down, while staying within the 40 - 60% RH range.

I.8c Measuring Humidity

An accurate instrument for measuring humidity in storage and operating areas will be required. Even work and storage areas under automatic humidity control should be checked when wavy or tight edge problems are experienced.

I.8d External Overloading

When external conditions are extremely hot and dry or hot and humid, open doors can overload any system. Also, upward or downward adjustments in controlled environment settings may be required during dry winter seasons or during rainy summer seasons.

I.9 PAPER STORAGE

Storage conditions, temperature and humidity can have a definite influence on how paper behaves in printing and mailing equipment.

General Storage guidelines

1. Store paper in original cartons and ream wrappers.
2. Store paper between 64 - 90° F (10 - 30° C) and 40 - 60% Relative Humidity.
3. Always store paper up and away from cement floors and away from cement block walls. Store the paper on shelves or a wooden pallet. This will reduce moisture absorption.
4. If a high humidity environment exists, store any partially used reams of paper in plastic bags.

5. If paper has picked up moisture content causing excessive curl, store the paper in a less humid environment for 24 to 48 hours.

I.10 PAPER SPECIFICATIONS

PAPER WEIGHTS

NOTE: The minimum paperweight recommended for use in the M-8 and M-8 INS is 24-pound bond paper. (90 GSM)

Grams Per Square Meter

The unit "Grams per Square Meter"(GSM or g/m²) is universally accepted. The unit expresses the weight in grams of a square sheet of paper with sides one meter in length or an equivalent area.

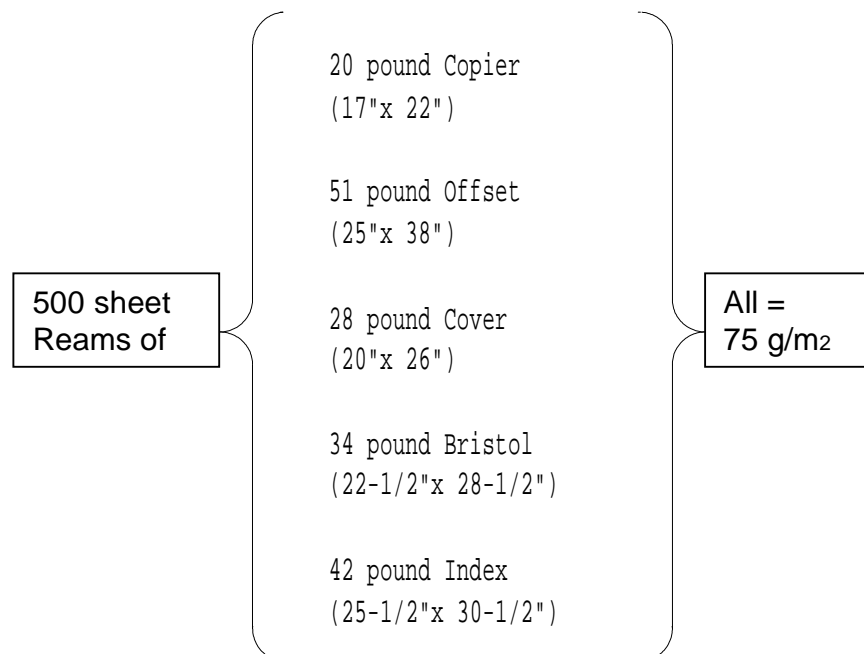
Traditional Units

Traditional units express paperweight for stacks of 500 sheets of each type of paper in a certain size. For example, the basic size for copier paper is 17"x22", while the basic size for index stock is 25"x30".

Chart Of Equivalent Paper Weights

This chart gives weights of different paper types that are all equal to the same grams per square meter. Weights are based on stacks of 500 sheets or the paper size listed at the top of each column.

Example: Row 3 in chart below shows:

**EQUIVALENT PAPER WEIGHT CHART**

(in reams of 500 sheets)

| Copier | Offset | Cover | Bristol | Index | Grammage (g/m ²) |
|--------|--------|-------|-----------|-----------|------------------------------|
| 17x22 | 25x38 | 20x26 | 22.5x28.5 | 25.5x30.5 | |
| 13 | 33 | 18 | 22 | 27 | 49 |
| 16 | 41 | 22 | 27 | 33 | 61 |
| 20 | 51 | 28 | 34 | 42 | 75 |
| 24 | 61 | 33 | 41 | 50 | 90 |
| 28 | 71 | 39 | 48 | 58 | 105 |
| 32 | 81 | 45 | 55 | 67 | 120 |
| 36 | 91 | 50 | 62 | 75 | 135 |
| 40 | 102 | 56 | 69 | 83 | 158 |
| 43 | 110 | 60 | 74 | 90 | 163 |
| 47 | 119 | 65 | 80 | 97 | 176 |
| 53 | 135 | 74 | 91 | 110 | 203 |

Copier = same as dual purpose, bond, duplicator, mimeo, ledger, vellum and onion skin.

UNITED STATES COMMON PAPER SIZES

| REAMS OF | MILLIMETERS |
|-----------|-------------|
| 4x9 | 102x229 |
| 4.5x6 | 114x152 |
| 5.5x8.5 | 140x216 |
| 6x9 | 152x229 |
| 7x12 | 177.8x305 |
| 8.5x11 | 216x279 |
| 8.5x13 | 216x330 |
| 8.5x14 | 216x356 |
| 9x12 | 229x305 |
| 11x17 | 279x432 |
| 12x18 | 305x457 |
| 14x25 | 356x635 |
| 17x22 | 432x559 |
| 18x24 | 457x610 |
| 20x26 | 508x660 |
| 22.5x28.5 | 572x724 |
| 22.5x35 | 572x889 |
| 24x36 | 610x914 |
| 25x38 | 635x965 |
| 25.5x30.5 | 648x762 |

NOTE: Paper is normally cut to standard sizes; however, it can be ordered specially cut to any desired size.

INTERNATIONAL PAPER SIZES

| SHEET SIZE | INCHES | MILLIMETERS |
|------------|---------------|----------------|
| 4A | 66.22 x 93.62 | 1692 x 2377.95 |
| 2A | 46.81 x 66.22 | 1189 x 1692 |
| A0 | 33.11 x 46.91 | 841 x 1189 |
| A1 | 23.39 x 33.11 | 594 x 841 |
| A2 | 16.54 x 23.39 | 420 x 594 |
| A3 | 11.69 x 16.54 | 297 x 420 |
| A4 | 8.27 x 11.69 | 210 x 297 |
| A5 | 5.83 x 8.27 | 148 x 210 |
| A6 | 4.13 x 5.83 | 105 x 148 |
| A7 | 2.91 x 4.18 | 74 x 105 |
| A8 | 5.05 x 2.91 | 52 x 74 |
| A9 | 1.46 x 2.05 | 37 x 52 |
| A10 | 1.02 x 1.46 | 26 x 37 |
| 2B | 55.67 x 78.74 | 1414 x 1500 |
| B0 | 39.37 x 55.67 | 1000 x 1414 |
| B1 | 27.83 x 39.37 | 707 x 1000 |
| B2 | 19.68 x 27.83 | 500 x 707 |
| B3 | 13.9 x 19.68 | 353 x 500 |
| B4 | 9.84 x 13.9 | 250 x 353 |
| B5 | 6.93 x 9.84 | 176 x 250 |

MAILHANDLING PAPER SPECIFICATIONS

(Cut Sheet, Continuous Forms, Envelopes, And Inserts)

| Property | Rating |
|------------------------------|---------------------------------------|
| Paperweight | 20 - 24 lbs (75-90g/m ²) |
| Porosity | 20 Gurley Seconds |
| Grain Direction Stiffness: | |
| 20 Lb. Stock | 175-225 Gurley Stiffness Units |
| 24 Lb. Stock | 250-300 Gurley Stiffness Units |
| Cross Grain Stiffness: | |
| 20 Lb. Stock | 80-125 Gurley Stiffness Units |
| 24 Lb. Stock | 12-150 Gurley Stiffness Units |
| Moisture Content | 4 - 6% by Weight |
| Perforation Strength (Page): | |
| Folded | 4 Lbs. Minimum (Lbs./Inch) |
| Unfolded | 1 Lb. Greater Than Folded (Lbs./Inch) |

PERFORATIONS FOR BURSTING & FOLDING

A minimum of 12 Cuts Per Inch

A Minimum of 0.032" Per Tie (On Perforations)

A Maximum of 0.04 Per Tie (On Perforations)